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Ross

Rate-Making for Workmen's Compensation
Insurance in the United States

RATE-MAKING FOR WORKMEN'S COMPENSATION INSURANCE
IN THE UNITED STATES

BY

KENNETH DWIGHT ROSS
A. B. University of Illinois, 1916.

THESIS

Submitted in Partial Fulfillment of the Requirements for the

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I HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER MY SUPER-
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Insurance in the United States

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on
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*Required for doctor's degree but not for master's.

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THE HISTORY OF THE
CITY OF BOSTON

By
JOSEPH NEALE

Author of
"The History of the City of New York"

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RATE-MAKING FOR WORKMEN'S COMPENSATION

INSURANCE IN THE UNITED STATES

I. THE DEVELOPMENT OF RATE-MAKING ORGANIZATIONS

The problems of making scientific and accurate rates for the insurance of the risks due to accidental injuries to workmen have been brought forcibly before the attention of law makers, the employing class, and the casualty insurance companies of the United States only within the last few years. Under the old employers' liability laws of the various states the cost of insurance to the employer covered not so much compensation for accidents to the workmen as protection from suit for the employer. The expense under the old form was an uncertain factor, which varied with the costs of suits and the excellence of the lawyers whom the companies employed. The common law doctrines of the assumption of risk, the fellow servant, and contributory negligence made convenient loopholes of escape for the insurer. The result of the employers' liability system was that the rate, however it may have been formed, made large provision for litigation in comparison with the provision for payment to the injured workmen.

Although most of the countries of Europe had laws



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which repealed the three common law doctrines even in the latter part of the last century,¹ there was no compensation law in the United States until 1908. In this year the Federal Government enacted a compensation law for government employes. However, the provision for awards in this act were not liberal, and its scope was narrow. It was not until 1910 that New York enacted the first state workmen's compensation law.²

With its enactment the need for scientific rates arose. The United States, which had hitherto been backward in its protection for injured workmen, awoke from its lethargy, and started to cast out the old unsatisfactory, often vicious system, and to substitute for it the more logical, more humane system of workmen's compensation--a system the chief object of which is to compensate the employe for injuries received rather than to protect the employer against suits for damages.

Although such a short time has elapsed since the enactment of the first state workmen's compensation law, thirty-seven states have workmen's compensation laws among their statutes at the present time.³ The workmen's compensation system, thru its

¹For a brief history of workmen's compensation in foreign countries see Edmund Dwight, The Risk and Development of Employment Liability Insurance, Economic World, March 3, 1917, page 311. A more complete account of foreign compensation laws is to be found in Bulletin Number 203 of the United States Bureau of Labor Statistics, Workmen's Compensation in the United States and Foreign Countries.

²As this law was declared unconstitutional early in 1911, the acts passed in 1911 were really the first state compensation laws.

³Of these five have been enacted in 1917.

abolition of the doctrines of the fellow servant, contributory negligence, and the assumption of risk, guaranteed that the workman should be compensated when he was injured in the course of his employment, regardless of the cause of the accident. The insurance came to be a protection for workmen, and the problems of rate-making became problems of finding the cost of this insurance.

That the rates should be equitable, everyone was agreed. That they should be adequate was an accepted fact. That they should not be excessive was generally conceded. While the compensational cost in its ultimate incidence is theoretically upon the consumer, at first, at least, it is upon the employer, since he must pay the insurance premiums. The expense to the community is small,¹ yet it is an item of considerable importance to the employer. As in the case of the other elements in the cost of production, the employer wishes his compensation costs to be as low as possible, and he does not want to pay more than his due share. On the opposite side, the community demands that the amount paid shall be sufficient to cover the entire cost of the protection offered. Thus it is that we see the necessity of scientific rates--rates that are equitable, are adequate, yet are not excessive.

To cope with the difficulties that have appeared in making rates which should approach the ideals demanded, various

¹See E. H. Downey, The Organization of Workmen's Compensation Insurance, Journal of Political Economy, December, 1916, pages 954-955.

organizations have arisen. The men in these organizations have been in most cases eminently qualified for the task which has been assigned to them, and as a result the problems of workmen's compensation rate-making have been attacked in a manner that has already produced remarkable results and promises well for the future.

We shall attempt to give some idea as to the nature of the rate-making organizations, and of the work they have accomplished. While it will be impossible to do more than indicate a few of the most important agencies, such a survey may serve to show the interest that has been displayed within the last few years with regard to workmen's compensation, and to give some notion as to the intensive study that has been made.

Although it is difficult to make any inclusive classification of the agencies which have dealt with rate-making, it seems advisable to divide them into private companies, state organizations, conferences, and other temporary organizations, and societies.

The National Workmen's Compensation Service Bureau

Of the private company organizations, that which has done the most extensive work on rate-making problems is the National Workmen's Compensation Service Bureau. It is maintained by about twenty of the largest casualty companies in the country. These companies had realized, even in the days of liability insurance, the need of some central bureau for the making of standard rates, and accordingly had created the Bureau of Liability Insurance Statistics as a result of the Liability

Conference which was formed in 1896. After the passage of the New York Compensation law in 1910 the companies saw the necessity of considering the effects of the act.

"This Bureau grew out of a meeting of some seventeen companies held on July 6, 1910, for the purpose of discussing the New York Workmen's Compensation Law, which had just been enacted. Two committees were appointed, one to consider the question of constitutionality, and the other to get out a manual and establish underwriting rules. The work of this latter committee, which was known as the Committee of Seven, became so extensive that they recommended the formation of a bureau. The result was the formation of this Bureau, which, at its inception, was called the Workmen's Compensation Service and Information Bureau. The organization was effected on December 6, 1910.

"The name has been changed twice since the formation of the Bureau in 1910, first to Workmen's Compensation Service Bureau, and later to the National Workmen's Compensation Service Bureau."¹

As the various states began to pass workmen's compensation laws, the scope of the Bureau widened. Not only did it formulate the rates of its member companies for workmen's compensation, but, when state laws providing State Funds were enacted, it furnished rates for them as well, and collaborated with them in the accumulation of data and statistics. The

¹A letter from Professor Albert W. Whitney, General Manager of the Bureau.

statistics compiled by the Bureau form the basis of nearly all the rates quoted thruout the country. It has attacked the problem of merit rating discussed below¹; it has published various articles on workmen's compensation, most of them, however, dealing with the advantages of insurance in stock companies over state funds and mutual organizations, also discussed to some extent later; it maintains a corps of engineers to pass on the efficacy of various safety devices, and to formulate plans for accident prevention.

The Associated Companies

While the National Workmen's Compensation Service Bureau is the most important organization of private companies in the field of workmen's compensation taken as a whole, in the coal mining industry the Associated Companies deals with the problems of rate making. The Associated Companies is a combination composed of ten stock insurance companies. It has established, with the aid of statistics furnished by the United States Bureau of Mines, insurance rates in the coal mining industry, and has, among other activities, inaugurated an excellent system of merit rating.²

State Boards and Commissions

It would not be possible, in a limited space, to make any comprehensive review of the state organizations which have

¹See chapter on Merit Rating, page 75.

²The Merit Rating plan of the Associated Companies is described on page 79.

been working upon the actuarial considerations of workmen's compensation. Such a summary would involve an account of the state organizations in the greater number of the thirty-seven states having compensation insurance laws.

Most of the state laws in force provide for some kind of a commission or board to carry out the provisions of the law. Whether this commission is merely of a supervisory nature, or whether it has rate-making powers, depends largely upon the character of the law under which it acts. In the case of the larger states, naturally more adequate appropriations are available with which to extend the activities of the commissions, and the importance of accurate rates is more clearly recognized. Where the law provides for the operation of a state fund the board or commission is directly interested in making rates, since the state is itself engaged in the insurance business, a state fund being one which is administered by state officials under the jurisdiction of the board or commission.

The activities of the various boards and commissions and of the state funds are to be found in the reports which they issue. Some of the most valuable of these are the reports of the Industrial Boards or Commissions of New York, California, and Ohio, where state funds are in operation, and of Massachusetts, Illinois, and Wisconsin, where the business is left in the hands of private organizations.

These boards and commissions, like the other agencies interested in workmen's compensation, have felt the need for concerted action, and maintain an organization known as the

International Association of Industrial Accident Boards and Commissions. In its meeting of January, 1915, the Association created a committee on Statistics and Compensation Insurance Cost. The most important work of the Association in the matter of rate-making has been the adoption of two reports of this committee. The first report was made at the meeting which extended from September 30 to October 2, 1915, and was concerned with a uniform classification of industries, mentioned later.¹ The second, which was presented at the meeting of April, 1916, was in regard to a uniform classification of the causes of injuries. The Association was also instrumental in calling the Conference on Social Insurance which met in Washington, D.C., December 5-9, 1916.²

State Insurance Departments

The insurance departments of the various states having compensation laws are directly interested in insurance rates, since the companies carrying on the compensation business must make reports to them, and since they have supervisory powers over rates and insurance reserves. As evidence of the fact that insurance commissioners appreciate the necessity of securing adequate rates in workmen's compensation mention may be made of the work of the committee on "Reserves other than Life" of the

¹See chapter on the New Premium, page 20.

²The proceedings of this Conference are to be published in a special bulletin issued by the United States Bureau of Labor.

the National Convention of Insurance Commissioners. A discussion of the recommendations of the committee with regard to reserves for workmen's compensation insurance is given in the chapter on "Adequate Rates and Reserves."¹

State Rating and Inspection Bureaus

Another and somewhat unique class of state organizations are the State Rating and Inspection Bureaus. Among the states in which organizations of this kind have been formed are New York (1914), Massachusetts (1915), Pennsylvania (1916), and New Jersey (1917). The Bureaus consist of a combination for rating and inspection purposes of the stock companies doing business within the state, the mutual companies, and the State Fund where one is in operation. They have been created either by law or at the instance of the agencies interested in the business of workmen's compensation. They have powers to establish rates, inspect risks, determine upon and operate a system of merit rating, see that adequate rates are maintained, and also may perform various other functions.² The Bureaus are administered by an appointed manager and are governed by committees whose membership is divided among the stock companies, the mutuals, and state fund or state insurance department. All the member organizations share the expense of the Bureaus.

¹Page 94.

²See chapter on Adequate Rates and Reserves, page 90.

Joint Conference on Workmen's Compensation Insurance Rates 1915

Of the various conferences on rate-making that have been thus far held, one stands out preeminently. It is the Joint Conference on Workmen's Compensation Insurance Rates which was held in New York City in 1915. The membership of this conference consisted of the Massachusetts Rating and Inspection Bureau, the Compensation Inspection Rating Board of New York, the Workmen's Compensation Service Bureau, the Insurance Departments of California, Maryland, Washington, New York, Pennsylvania, and the Industrial Commission of Wisconsin. The Conference held three meetings in 1915, and considered the reports of four committees which had been appointed. In the reports of these committees was embodied the consensus of opinion (at least at that time) of some of the best trained men in workmen's compensation in the country, and one may well characterize the Joint Conference as a land mark in workmen's compensation rate-making.¹

The Augmented Standing Committee

The most recent, and at the same time, the most important work which has been done in making workmen's compensation rates, is that which has just been completed by what is known as the Augmented Standing Committee. This committee was formed at the instance of Jesse S. Phillips, Superintendent of Insurance of New York, and is made up of members of the Manual Committee of the National Workmen's Compensation Bureau,

¹The proceedings of the Conference may be found in a pamphlet published by the New York State Insurance Department.

together with representatives from the New York Compensation Inspection Rating Board, the Pennsylvania Compensation Rating and Inspection Bureau, and the Massachusetts Rating and Inspection Bureau, "augmented by the addition of two stock companies and two mutual companies, the former selected by the National Bureau and the latter by the Federation of Mutual Casualty Companies. This committee, because of its representative character, received the approval of the Insurance Departments of New York, Pennsylvania, and Massachusetts, representatives of which sat with the committee in its deliberations."¹ The revised basic manual of the committee, which has just appeared, is thought to be a great advance over any before in use.

The Casualty, Actuarial, and Statistical Society of America

The need for a society to consider the actuarial problems of workmen's compensation had been felt for some time. Even as early as 1909 Mr. Stanley L. Otis, then actuary of the Bureau of Liability Insurance Statistics, had taken some steps to form a society of actuaries and statisticians of liability insurance companies, but the organization was never effected. While the Transactions of the Actuarial Society of America have included a few articles upon workmen's compensation subjects, that society, primarily interested in life insurance problems, was not in a position to make an extensive consideration of workmen's compensation. With ^{the} growing importance of workmen's compensation the

¹Fire, Casualty, and Miscellaneous Section of the Spectator, April 19, 1917, page 25.

need for a society to consider problems of workmen's compensation crystallized in the formation of the Casualty, Actuarial, and Statistical Society of America, on November 7, 1914.

While the imposing title of the Society leaves it a broad field in which to work, its main activities thus far have been directed toward the actuarial aspects of workmen's compensation. The membership of the society includes practically all of the better known men in the field of workmen's compensation. With such a membership it is not surprising that excellent articles have been presented to the society for consideration and discussion. Indeed, the Proceedings of the Society, which are published about three times a year, furnish the most valuable source of information available at the present time to the student of workmen's compensation rate-making.

This short outline of the four main classes of organizations working on rate-making--private companies, state organizations, conferences and other temporary organizations, and societies--may serve to give the reader some idea of what has been done toward the solution of rate-making problems, and leads us to a treatment of the principles of rate-making. Fundamental to such a consideration is a discussion of the "Net Premium", which is the subject of chapter two.

II. THE NET PREMIUM

The Basic Problem of Rate-Making

In all forms of insurance the fundamental problem of rate-making is the determination of accurate net premiums. By the net premium, as the term is used in the present paper, is meant the amount computed to be necessary to insure a risk, leaving out all considerations of expense and profit. It differs from the pure premium in that the latter shows the actual cost of the insurance within fluctuations due to chance or random sampling, while the net premium is the amount computed to be the cost. It represents the calculation of, or approximation to the pure premium. The terms "net premium" and "pure premium" are usually employed interchangeably, but it seems advantageous to make this distinction, the reason for which will be more clearly explained in the chapter on the Gross Premium.¹ At least one criterion of the stage of development of the form of insurance in question is the degree of fluctuation of the net premium from the pure premium.

Life insurance, from its long years of development, has evolved satisfactory mortality tables and a system which reflects very closely in its net premium the pure premium. While fire insurance cannot become, from its very nature, as

¹See page 47.

accurate as has life insurance, yet the experience of many years is present as an aid. Very different is workmen's compensation insurance. Here is a problem more complicated than that of either life or fire insurance, a new field to enter, and inadequate statistical data as a basis unless the experience of foreign countries acting under different compensation laws, with a different working population, under far different industrial conditions is employed. It took centuries of development before life insurance reached its present state of perfection. It would not seem strange that workmen's compensation rates should be inaccurate and unsatisfactory for a long time to come. However, one important factor militates in favor of workmen's compensation. When the system of life insurance was started, men knew nothing of the method of attacking the problem. They lacked actuarial knowledge and were untrained in statistical methods. Today, when workmen's compensation insurance is to be considered there are available a body of trained actuaries, statisticians, and safety engineers, whose sharpened perceptions and active minds have been squarely directed upon the question of making rates for workmen's compensation. With such a force of men it is not strange that rate-making in workmen's compensation should have become remarkably scientific and accurate, considering the short period in which workmen's compensation laws have been in effect.

The Elements of the Net Premium

While the basic problem of all insurance is the same, its treatment must of necessity be markedly different, and must vary greatly between classes of insurance. In life insurance there are two important elements--mortality and interest. The two most important elements in fire insurance are the frequency of fires and their seriousness. The problem of workmen's compensation combines the elements both of life insurance and of fire insurance. Human lives, with the consequent probabilities of dying and of living, are to be dealt with. Long periods of time are covered in some cases, thus making the consideration of interest of considerable importance. Perhaps, however, the analogy to fire insurance is more complete. Where fire insurance has the frequency of fires, workmen's compensation has its accident frequency rate. Where fire insurance has to consider the seriousness of fires, workmen's compensation must take into account accident gravity.

Fire insurance and workmen's compensation both differ from life insurance in that they insure against losses which may or may not be incurred, while the ordinary whole-life policy in life insurance provides indemnity against loss that is sure to come. A plant may burn at any time, but it may not have a fire in a hundred years. A workman may be injured within a month after he is employed, or he may never be laid off because of an injury. Yet every man must die, and the loss to be insured against, in whole-life policies, at least, is thus a certainty, the only element of conjecture being the time to elapse.

Workmen's compensation has one more element to take into account which exists in neither life insurance nor fire insurance. This is the matter of state classification of benefits. In life insurance a certain beneficiary gets the amount of the policy at the death of the insured. A loss by fire calls for the return of an amount settled by the terms of the policy. In workmen's compensation, however, state laws specify what a workman shall receive for each kind of injury--what he shall be granted in case of death, for total disability, and for other classes of injuries. Further, the various states, following their usual methods, are not at all uniform in their provisions. In the thirty-seven state workmen's compensation laws, it is probably safe to say that no two give exactly the same benefits.

There are three main elements in the problem of making net premiums for workmen's compensation insurance. All other elements may be placed in a subdivision under these. The three are: (1) accident frequency rates, (2) accident gravity rates, (3) scales of benefits as provided by the various state laws.

The Classification of Industries

It now becomes essential to consider to some extent each of these three elements, to show their bearing upon the problem in hand, to point out a few of the principal difficulties that are encountered in their application, and to show how these difficulties have been attacked and at least partially overcome. However, before this can be done, some method must be settled

upon for classifying the diversified and complex industrial activities which exist thruout the country. Before accident rates can be computed an answer must be made to the question; accident rates for what? Is a given accident to be classified as occuring within a group of allied industries, in a given industry, in a certain process of manufacture, or in some other classification that may be devised?

There are three main methods which may be employed. The first of these, as has been indicated, is the industry classification, the second the entrepreneurial classification, and the third the classification by processes.

The classification by groups of industries has been adopted under the German system of workmen's compensation. Under this method all the industries of the country are grouped into some thirty-five allied classes, and rates are fixed for each of these classes as a basis. The problem of gathering statistics is relatively simple under this method, as there are only a few large groups, for which adequate data are readily secured. The great difficulty with the system is that it does not offer to the individual industry and to the individual plant a rate that reflects its own hazard. Some industries bear more than their due share of the insurance cost, while other industries do not pay their full cost as measured by their relative hazards. In Germany, where there is a wide application of state insurance of various kinds, and where governmental control of insurance is much in vogue, such a system can be carried out, although even

in Germany considerable deviation is found from the hard and fast principle.

In the United States, where workmen's compensation insurance is sold under competitive conditions, and is purely a matter of business with the individual employer, it is essential that the rate should more closely fit the individual hazard, as is explained somewhat more fully further in this chapter, and also in the chapter on Merit Rating.¹ The classification by industries would hardly be expected to work satisfactorily, if at all, in this country, although it would have certain very marked advantages from the standpoint of rate computation.

Under the competitive conditions that have been mentioned, the classification actually in use grew up--the classification by establishments, or entrepreneurial classification. The grouping of industrial hazards for workmen's compensation was an outgrowth of the old employer's liability system. The casualty companies, which wrote liability insurance before the enactment of workmen's compensation laws, merged the old system into the new. As far as rates were concerned, liability insurance had never been scientific, and naturally the new system was under a handicap in using the tools of the old. Liability insurance was written under a competitive regime in insurance. As far as the casualty companies were concerned, workmen's compensation was also competitive. Competitive reasons had evolved the classification used under liability insurance. Competitive conditions

¹ See page 67.

argued for its retention. Under the liability regime, the system was what has been called entrepreneurial. The employer wanted a rate on his own kind of plant. If he happened to be a maker of window glass, he did not want his industry classed with that of a maker of plate glass. He expected a different rate, and one developed on a different basis. Competitive needs brought about a subdivision of risk classes, until the manual of rates contained about 1500. With a few classifications, in such large industries as coal mining and boots and shoe manufacturing, statistics were ample to secure accurate rates of accidents. They were not adequate in the great majority of classifications.

When the workmen's compensation system came into vogue, underwriters still wanted rates built upon the basis of the establishment, in order that insurance might find a ready sale. Existing classifications had been tested by their selling advantages, and had proved satisfactory in this respect. Agents, and rate-makers themselves, were averse to a complete overthrow of the system and the casting aside of the statistical data that had been secured under the operation of the liability laws. As a result, the method actually adopted by the National Workmen's Compensation Service Bureau¹, was a modification of the old system. The manual now contains about 1500 classifications as before.

Various attempts have been made to amend the manual and to simplify it. One of the most notable is that of the

¹Then the Workmen's Compensation Service and Information Bureau.

Committee on Statistics and Compensation Insurance Cost of the National Association of Industrial Accident Boards and Commissions.¹ This committee classified all the industries in the United States, first into seven divisions, and then subdivided these into forty-three schedules. The schedules in turn were divided into two hundred and seventy-two groups, which resolved into the classifications used by the insurance companies.²

Under the complex organization of industry in the United States it appears that if the entrepreneurial system of classification is retained it will be impracticable to reduce the number of classes. With this large number it will be practically impossible to secure adequate statistics from the experience of any one state for many years to come. It has been estimated that in five years Massachusetts will have adequate experience for only some thirty of the 1500 classes, while even New York, with its huge industrial activity, will have sufficient data for only a small minority.³ Even in ten years many classifications will still have had an inadequate experience, if the criterion that a single death shall not affect rates by more than one percent is employed.⁴ With the rapid growth of industries in this

¹The report of this committee is given in a bulletin of the United States Bureau of Labor Statistics, August, 1916, whole number 201.

²For a further description of the grouping adopted and enumeration of the classifications see the report of the committee.

³E. H. Downey, Classification of Industries for Workmen's Compensation Insurance, Proceedings of the Casualty, Actuarial, and Statistical Society, October, 1915, page 15.

⁴Ibid., page 13.

country, changes in processes, improvements, the more adequate reporting of accidents under the operation of a compensation law, ten years is considered the longest period for which statistics of accidents are reliable.

That the cost of compensation resulting from a more complete reporting of accidents does materially increase with the age of a compensation law is shown rather conclusively by the following statistics, showing the operation of various foreign laws:¹

	Austria	Belgium	France	Holland	Great Britain
First year	1.00	1.00	1.00	1.00	1.00
Second year	1.16	1.11	1.16	1.18	1.13
Third year	1.29	1.12	1.04	1.23	1.23
Fourth year	1.38	1.20	1.06	1.29	1.26

The experience of the various states is already proving the correctness of the theory that compensational cost increases with the age of the act, especially in New York, where the cost for 1916 has shown a remarkable increase over that in 1914 and 1915. It is believed, however, that under a law which prevents employes from reporting accidents for which they should not receive compensation, the effect of the more adequate use of the benefits will wear off, after a certain length of time, and this source of difficulty will be obviated.²

¹These statistics are given in an article in the Economic World January 8, 1916, Synthesis of Rates for Workmen's Compensation, by Claude E. Scattergood, page 56.

²See a pamphlet by P. Tecumseh Sherman, The Progressive Cost of Workmen's Compensation.

It is seen to be essential that the statistics to be used apply to a relatively short period of time. Yet, as has been brought out, with the many classes existing at present, it is impossible to secure adequate statistics for each state within this time. Naturally one of two remedies is applicable. Rate-makers may either retain the present system, improve it, and supplement the lack of statistics by other means, or they may discard the system altogether, and strive for another classification.

If the present system is to be retained the inconsistencies in the classifications must, of course, be eliminated. These are mere passing defects, which experience will remedy. Such defects will result in any system that is inaugurated, and can be removed as they are found. What is referred to is the fundamental weakness of the system, which is found in the want of a sufficient exposure (a large enough statistical experience that chance deviations may not vitiate the reliability of the average) in many of the classes, due to the many subdivisions of industries. Even though the experience of the various states is combined some kind of underwriting judgement, or some mathematical formula, or a combination of both, must be found by which the gaps which are left open by the lack of statistics can be filled.

Such a method is indeed used in computing the manual rates, and a modification of it is explained in the Proceedings of the Casualty, Actuarial, and Statistical Society.¹ The

¹Albert H. Mowbray, The Determination of Pure Premiums for Minor Classifications on which the Experience Data is Insufficient for Direct Estimate, October, 1915, page 124.

fundamental assumptions underlying the method are these:

First, it is assumed that a certain number of classes exist in which there is a sufficient exposure to calculate rates directly.

Also there are present a number of other classes which are similar in nature, but for which the experience is not sufficient. Third, it is assumed that underwriting judgement--at least that of safety engineers--may be depended upon to determine relative hazards within comparatively small divisions of industry.

As the method is outlined by Mr. Mowbray in its modified form,¹ the estimated relative hazard of each of the industries for which the statistics are insufficient is expressed as a percentage of that for which adequate data are at hand. The observed payroll of each class is multiplied by its corresponding percentage, which reduces the payroll of each to a standard basis. The sum of the observed losses, divided by the sum of these standard payrolls, produces a factor, which, multiplied by the payroll of each class on the standard basis, will give the projected loss for each class. The net premium may be obtained by dividing the projected losses by the observed pay roll.

The following hypothetical table which Mr. Mowbray gives may help to explain the method:

¹Albert H. Mowbray, The Determination of Pure Premiums for Minor Classifications on which the Experience Data is Insufficient for Direct Estimate, October, 1915, page 133.

Classi- fication	Judgment Rating	Observed payroll	Corresp. P R Standard B	Observed Losses	Pure Orig. Exper.	Prem adj by Form-	Pro- jected losses
						ula	
A	.50	\$ 500,000	250,000	2,500	.50	.062	310
B	.75	1000,000	750,000	1,000	.10	.093	930
C	1.00	80000,000	80000,000	100,000	.125	.124	99,200
D	1.25	5000,000	6250,000	5,000	.10	.155	7,750
<hr/>							
		\$86500,000	87250,000	108,250 ¹	.125	.124	108,190
<hr/>							
Deficiency of Projected under actual loss approximately 6/100%.							

That such a method is a makeshift must be admitted, yet it is a makeshift that will give a very close approximation of the results to be desired. As long as the present system is retained it is almost inevitable that some such method be used to supplement the statistics.

The second alternative, that of overthrowing the prevailing classification altogether, has led to the suggestion of the use of the third possible method. This is the classification by processes, and is set forth in the article by E. H. Downey,² to which reference has previously been made. The main contention in this article is that industrial hazard does not follow the industry, but that it does follow the process. All manufacturing activities may be divided into a comparatively small number of processes.

If the assumption is correct, the hazard for the process will be the same no matter in what industry it may be carried out. The problem becomes the gathering of statistics for the

¹The error in addition appears in the original.

²E. H. Downey, Classification of Industries for Workmen's Compensation Insurance, Proceedings of the Casualty, Actuarial, and Statistical Society, October, 1915, page 10.

accident rates in the given processes. As it is outlined, the plan presents appealing features. It looks simple, and it seems logical. Its main difficulties do not lie in any theoretical defects, but in its practical working. The system would entail throwing away most of the statistics that have thus far been gathered, the construction of an altogether new manual, and other transitional difficulties. These, however, would not condemn it should its advantages be so marked as to outweigh the costs and inconveniences of the change. Other objections are of more importance. Rates for workmen's compensation, as they are now computed, are based on the amount of the yearly payroll of a concern. The use of the process classification would mean that many plants would come under a number of classes, numerous subdivisions of payroll would be necessitated, and the expense of carrying on the business would in this way be increased. Again, the method would hardly appeal to the employer as a single rate for his whole plant does. The business phases of workmen's compensation insurance must always be kept in mind. Insurance must be made as attractive to the employer as is possible, and in some cases extreme actuarial accuracy must be sacrificed to good salesmanship. The actuary is confronted with the difficult task of modeling his method upon a system that is laid down by the insurance salesman, who does not have in mind scientific rate-making so much as successful insurance selling.

The conclusion results that of the methods of classification which have been advanced, the one in use is the most practical at present. That it is far from perfect must be

granted. It is not probable, however, that it will be superseded by another classification, at least in the near future. The rate-maker must, therefore, take the system as it is, improve it as far as is possible, and strive to obtain as accurate rates as he can with its use. The difficulties incident to the lack of statistics may be to a large measure overcome by a combination of the data of the various states, when compiled upon a uniform basis.

Accident Rates

After the method of classification is decided upon the rate-maker comes directly to the actual process of making rates. The three main elements involved, as before stated, are the accident frequency rate, the accident gravity rate, and the benefits as granted by the various state laws. The first two of these are very closely connected, since the statistics show at the same time the number of accidents and their severity.

Statistics of accidents are in a very unsatisfactory condition in this country. Except in the case of the accidents occurring under the workmen's compensation acts, the statistics are not reported uniformly, and the fundamental method of establishing their rate is defective. The rate of accidents is expressed in terms of the number of accidents per thousand workers in a classification for a year. The number of accidents divided by the number of workers will not produce the true rate of accidents. In some industries men work longer hours, and the employment is more certain and uniform than in others. The

total amount of exposure per thousand workers will not be the same in one industry as the exposure per thousand workers in another industry. The rate will naturally appear higher the larger the number of hours worked in a year by each man.

This difficulty has led to the suggestion of the United States Bureau of Labor Statistics that the basis upon which to compute accident rates be made a standard man year.¹ A standard man year is defined as a man working ten hours a day and 300 days in a year. All the exposure of a given industry is to be reduced to this basis, and the number of accidents actually occurring divided by the exposure as adjusted will give the accident rate. Such a method would be much more equitable to the individual industry than the present method of reporting accident rates and estimating exposure.

However, in the compilation of statistics for workmen's compensation from the data furnished by the various insurance companies, much of this difficulty disappears. The method in use among insurance companies is to base insurance cost on the total payroll of a plant for the year in which the insurance applies, and not upon the number of workers in the plant. The amount of exposure in a given plant is defined as the yearly payroll for the plant, which is estimated at the time when the insurance is taken out, and audited at the end of the year of insurance, any excess or deficiency being adjusted at this time.

¹A new Method of Computing Accident Rates, Monthly Review of the United States Bureau of Labor Statistics, July, 1916, pages 6-17.

If it is admitted that the amount of the payroll fairly measures the man year for the various employments, there is afforded an equitable measure of the accident rate. Naturally, however, the employer who pays his workmen more than the current rate is penalized, since his exposure becomes greater without any increase in the hazard.

What is called the Massachusetts Schedule Z is a form designed in Massachusetts to obtain a systematic classification and tabulation of loss costs. Under this schedule, the insurance companies in Massachusetts beginning December 31, 1912, were compelled to report the total amount of premiums received on policies, the payrolls, and the losses paid out and to be paid for each year.¹ The schedule is arranged to show the following:

1. Manual classifications
2. Earned payrolls
3. Earned premiums
4. Losses actually paid
5. Losses outstanding

The losses are divided into (a) death and dismemberment, (b) weekly indemnity, (c) medical service.

A form of Schedule Z is used by the various stock companies writing workmen's compensation business thruout the country, and the data so compiled is furnished to the National Workmen's Compensation Service Bureau for use in the construction

¹Compare the Report of the Massachusetts Commission to Investigate Practices and Rates in Insurance, 1915.

of rates. The value of such a uniform system of reports has been clearly shown by the results which the Augmented Standing Committee has been able to accomplish in its new manual of rates thru the use of the Bureau's statistics. The total amount of experience which the Bureau had rendered available amounted to about \$4,500,000,000 of payroll.

After the frequency rate for any industry has been found by dividing the total number of accidents by the exposure (the total payroll) the rate-maker has yet to determine the distribution of these accidents with respect to their severity. What is termed the gravity rate is in reality the percentages of the total number of accidents which fall within each of the various groups of equal degrees of severity. All the accidents are divided into those which cause death, those which bring about total permanent disability, those which result in dismemberment of one kind and another, and those which cause temporary disability, classified according to severity and length of time during which the disability continues. Each of these members, divided by the total number of accidents, will give the percentage of accidents of each class.

A determination of both the frequency with which accidents occur (the accident frequency rate) and of their gravity (the accident gravity rate) are required to determine the hazard to be insured in an industry. Two industries may not have the same relative number of accidents. This does not necessarily mean that the one with the higher frequency rate will

have a higher compensation cost. Its accidents, while more numerous, may be less serious, and the greater cost per accident of the second may more than counter-balance the higher frequency rate of the first. It is only thru a consideration of the two elements that any idea of the relative cost in two different industries can be gained.

The Influence of State Laws upon Rates

Although the accident frequency rates and the rates of accident gravity for each classification may be available, these alone are not enough with which to formulate insurance rates. Certain provisions in the workmen's compensation laws of the various states have a more or less direct effect on rate-making.¹

Three questions must be answered in determining the influence which state laws exert. The first of these is: What system of compensation is provided? the second: What industries come under the provisions of the act? and the third: What benefits are granted to the injured workmen?

As far as the first question is concerned, all of the thirty-two states which had compensation laws before 1917² provide some more or less practical system by which an injured

¹ A complete text of all the state laws enacted previous to 1917 is given in Bulletin No. 203 of the United States Bureau of Labor Statistics, on Workmen's Compensation in the United States and Foreign Countries. In the Digest of Workmen's Compensation Laws, Fourth Edition, by F. Robertson Jones, and its 1916 Supplement are contained a summary of the important features of the laws.

² As the laws of the five states which have enacted workmen's compensation laws in 1917 are not as yet available for examination no classification of these acts will be attempted.

workman is to be compensated. There are four classes of laws in this respect.¹ The first of these is termed an elective compensation act. Nineteen states (Colorado, Connecticut, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Michigan, Minnesota, Montana, Nebraska, New Hampshire, New Jersey, Pennsylvania, Rhode Island, Vermont, and Wisconsin) have this form, but in eleven of them the law is elective only as applied to private employers, and not to public employers. In this class of law, the employer may come under the provisions of the compensation act, or he may not, just as he desires. In case he does not elect to carry compensation he remains liable under the liability laws, but is deprived of the old common law defenses embodied in the doctrines of the fellow servant, contributory negligence, and the assumption of risk. He is not compelled to insure against accidents in any insurance company, but may carry his own risks if he is financially sound.

The next class of act is what is known as compulsory compensation. Here the employer has no choice, but must come under the new law. The old liability law is superseded. In this group, besides the Federal Government act, are five states (Arizona, California, Maryland, New York, and Oklahoma).

As a matter of fact the first and second classes of laws are not essentially different. Both provide that the workman shall be compensated in case of injury. The first, while

¹See Monthly Review of the United States Bureau of Labor Statistics, September, 1915, page 45.

ostensibly elective, is in most cases so worded as to become in fact almost compulsory. It is really only a subterfuge to escape constitutional difficulties, and to obviate the necessity of obtaining amendments to the state constitutions.

The third class of law is termed elective insurance. In this group we have five states (Massachusetts, Nevada, Oregon, Texas, and West Virginia).

The fourth class is called compulsory insurance. Ohio, Washington, and Wyoming are the states included in this group.

The third and fourth class are the same in one respect--both provide that compensation shall be secured by insurance. In this they are contrasted with the first and second groups, which do not specify that the employer must insure provided his financial standing is such that he is able to carry his own risks. The difference between groups three and four, as between groups one and two, is as to whether it is compulsory upon the part of employers to come under the provisions of the law. In group three, as in group one, an employer who does not elect compensation is deprived of the three common law defenses. Of course under the compulsory acts, whether of compulsory compensation or compulsory insurance, the old liability laws are superseded.

The effects of these provisions of state laws upon rate-making are two:

First, as regards the extent to which the act will be applied as contrasted with the extent of application of the old liability laws.

Second, as concerned with the extent to which insurance

will be resorted to as compared with self insurance.

Both of these effects are a question of degree, and influence the problem in its importance, but more directly in the adequacy of the statistics upon which rates are to be based. Laws of wide application, specifying a form of insurance, must lead to a more rapid and systematic compilation of statistical data. The experience of employers who do not come under the provisions of the act, or who carry their own insurance, will not be of aid in the same manner as the data gathered by the insurance companies.

Another, and more important feature of the various state laws, as affecting the problem of rate making, is in the industries covered by the acts. These vary in the thirty-two acts, from nearly all the industries of the state to only those that are termed "hazardous," "extrahazardous," "especially dangerous." Naturally it is of very little use to compute rates of industries which are not covered by the state law in question. There seems little justice in limiting the act in its scope in this manner. In theory at least, every workman has an equal right to compensation, regardless of the comparative danger of various employments. However, in making rates, the laws must be taken as they are found, and the methods of rate-making must be applied to the laws as they exist.

The factor in state laws that most directly affects the problem of rate-making is the benefits that the various laws give to a workman who is injured in the course of his employment. Here is the most tangible and definite basis upon which rates are computed. In most cases the laws state rather explicitly

the amount of the benefit to be paid for the various classes of injuries, and these statements must be followed exactly if the rates are to be accurate.

There is such a wide diversity of provisions in the laws of the thirty-two states which had workmen's compensation prior to 1917, and it is so difficult to classify them into a few general groups, that it becomes impossible in a limited space to make any extended survey of the benefits given. For this reason it was thought more practicable to discuss the laws of only four states. Those which will be considered are New York, Massachusetts, Illinois, and Pennsylvania. The New York act is an example of one of the older, more firmly established laws, yet is at the same time the most liberal in force. Massachusetts is considered since its labor laws as a rule may perhaps well be regarded as conservative yet progressive, and its compensation law as amended seems to be one of the best in force. The Illinois act furnishes an example of a very representative class, less liberal than those of New York and Massachusetts, but one which has been used as a basis for other acts in some particulars. The Pennsylvania act, effective in 1916, shows very well the later developments in the theory of workmen's compensation benefits, and for this reason it has been included in the consideration of the state laws.

Probably these four acts show as well as any four that could be selected the present status and trend of the benefits given by the state laws. Further, these states are all large and important industrially, and their acts are certain to have

influence upon the states that place workmen's compensation acts upon their statute books in the future.

The benefits which the laws give may be classified into those granted in case of death, in case of total disability, in case of partial disability, and for medical care and attention. An attempt will be made to outline briefly the benefits which are given in our four states in each of these cases.

If a workman is killed in the course of his employment, the benefits differ greatly in the several states. In New York a widow or dependent widower receives, until death or remarriage, thirty percent of the wages of the deceased workman. In case there are children under eighteen years of age, ten percent additional is given for each child. The total payment is not to exceed $66 \frac{2}{3}$ percent of the weekly wages. The provisions in the New York act of the payments depending upon survivorship and remarriage, make the calculation of death benefits exceedingly difficult, and entail some complicated actuarial computations. As a basis for these the Danish Survivorship Annuitants' Table of Mortality with $3 \frac{1}{2}$ percent interest, and the Remarriage Table of the Dutch Royal Insurance Institution are used. In view of the fact that there are no American Tables available for use in cases of survivorship and remarriage, these appear to be the best that can be obtained. Further justification for their use and the actuarial methods used in New York for computing the amount of the death benefits are given in the report of the New York State Workmen's Compensation Commission in 1915.¹

¹Report of the New York State Workmen's Compensation Commission from July 1, 1914, to December 31, 1914. Albany, 1915.

The Massachusetts act gives to dependents $66 \frac{2}{3}$ per cent of the wages of the deceased for a period of 500 weeks. The minimum weekly amount to be given is four dollars, while the maximum is ten dollars. The computation of these benefits becomes much less complicated than their calculation under the New York act, since annuities certain for a given term of years are substituted for life annuities depending upon survivorship and remarriage.

In Pennsylvania the benefits in case of death again are complicated and more nearly resemble those given by the New York law. Under the Pennsylvania act the benefits are from 15 to 60 percent of the wages, according to the number and kinship of the dependents; wages are taken at a maximum of twenty dollars, and a minimum of ten dollars weekly. The maximum period is 300 weeks, but in case of an abandoned or orphan child the benefit may continue at a reduced rate until the child reaches the age of sixteen. The compensation to a widow or dependent widower, as in the New York act, terminates upon remarriage.

The dependents in the case of the Illinois law receive four times the average annual earnings, but the maximum to be received is fixed at \$3500 and the minimum at \$1650. As will be seen, the computation under the Illinois law, as under the Massachusetts act, becomes simpler than under the New York and Pennsylvania laws.

All the state laws, including the four considered, provide a payment of from \$100 to \$200 for funeral expenses, in case the deceased workman has no dependents.

The second class of benefits which the state laws provide are those which are given in case of total disability. Total disability, as the phrase indicates, is a condition in which the injured workman is totally incapacitated. There are two classes of total disability--permanent and temporary. The benefits in case of total disability range from 50 percent of the wages of the injured workman for the period in which the disability continues, but not exceeding 300 weeks, to 66 2/3 percent of the wages during the entire term of the disability.

Except in the case of Oregon, all the states have provisions for what is called the "waiting period". The workman is not compensated in case of disability unless the disability continues for at least six days to two weeks, depending upon the law in question. The theory of the "waiting period" is that the employe should bear his share of the cost of accidents, and also that the incentive to lay off for a few days because of some trifling injury should be taken away.

Of the four states considered specifically, the New York law provides the most liberal compensation for total disability. The injured workman receives 66 2/3 percent of his weekly wages as long as the disability continues, but the maximum weekly amount to be received is fifteen dollars, while the minimum is five dollars. Next comes Massachusetts, in which 66 2/3 percent is also given, but in which the total period may not exceed 500 weeks, and in which a maximum of ten dollars and a minimum of four dollars is given. In Illinois the payment is 50 percent of the weekly earnings for eight years, with a maxi-

mum of twelve dollars and a minimum of six dollars. In case disability continues more than eight years, some provision is made for further compensation. The Pennsylvania law provides a payment of 50 percent of the injured workman's wages for a period of 500 weeks. The maximum payment is ten dollars while the minimum is five dollars.

The third class of benefits to be considered are those which are given in case of partial disability. This condition results when the workman is able to do some work, but is not in full possession of his faculties. Partial disability, like total disability, may be divided into the classes of permanent and temporary. In the case of partial disability, most states have certain enumerated injuries for which the workman receives a definite amount of compensation. These fixed benefits are granted mostly in the case of dismemberments. New York, Massachusetts, Illinois, and Pennsylvania all have these scales of benefits for enumerated injuries.

With partial disabilities the various laws do not display even as much uniformity as they do in the case of total disabilities. Most of them, however, give from 50 to $66 \frac{2}{3}$ percent of the wage decrease. The New York law, as in case of other benefits, is liberal in its awards in case of partial disabilities. In this state for those injuries which do not come under the specified injuries group the amount paid is $66 \frac{2}{3}$ percent of the wage decrease, with a minimum of five dollars and a maximum of fifteen dollars weekly. In Massachusetts, the amount of the award is also $66 \frac{2}{3}$ percent of the wage loss, but

the maximum is ten dollars and the longest period is 500 weeks. The Illinois act gives 50 percent of the wage decrease with a twelve dollar maximum, for a period of not more than eight years. In Pennsylvania the benefit is also 50 percent of the wage loss, but the maximum is ten dollars, and the longest period is 300 weeks.

The last benefit which is to be considered is that given for medical and surgical aid. Compensation for medical attention is granted by most of the state laws, but in greatly varying amounts. Some give medical aid only in case the workman dies leaving no dependents, while others allow the attention of a physician to a cost as high as the expense for eight weeks' care or a maximum of three hundred dollars in special cases.

As far as our four states are concerned, New York grants medical aid for sixty days; Massachusetts during the first two weeks; Illinois during the first eight weeks, but not to amount to over two hundred dollars; Pennsylvania during the first fourteen days, but not over twenty-five dollars, except in case of a major operation, in which case the maximum is seventy-five dollars.

From this brief survey of the main provisions of the state laws that affect rate-making problems, it will easily be seen what a complex task is before a central bureau when it sets about to interpret thirty-seven state laws, and to fix rates for each of the various classes. Further, the average present value of each of the benefits given must be calculated actuarially so as to reduce the benefits to a comparable basis.

The Basic Rate

In the method that has been used to form basic rates by the National Workmen's Compensation Bureau an application is made of what are known as state differentials. Under this system one law is taken as standard.¹ Rates are computed according to the benefits granted under this act. Theoretically, at least, there are available frequency rates for each of the various classifications, and also the accident gravity rates--the manner in which any group of accidents may be expected to distribute themselves in a given industry. The present value of the actual average benefit granted by the state law for each of the accidents which may be expected according to the table of accident gravity has been computed, together with the average expense for medical attention for each accident. The net premium for each class may now be calculated by the formula

$$\pi = 100 F (G_1 B_1 + G_2 B_2 + \text{-----} + G_r B_r)$$

In this formula π represents the net premium, F the accident frequency rate (the number of accidents divided by the total payroll), the series $G_1, G_2, \text{-----}, G_r$ the percentage of accidents of each kind, and the series $B_1, B_2, \text{-----}, B_r$ the present value of the corresponding benefits which are granted by the law. As the rate is expressed in terms of dollars and cents per \$100 of payroll, the rate must be multiplied by 100 to

¹The original Massachusetts law is the one that is actually employed for this purpose.

secure the actual net premium, which accounts for the factor 100 in the formula.

Practically there are not, in most cases, statistics so tabulated as to permit the establishment of the rate from such a subdivision of its components, for which reason the formula is usually expressed as follows:

$$\pi = 100 \left(\frac{L_1}{P} + \frac{L_2}{P} + \dots + \frac{L_r}{P} \right)$$

where L_1 , L_2 , \dots , L_r represent the losses from the various kinds of accidents, and P the payroll. It will be seen that these formulas really amount to the same thing, but the former perhaps shows more clearly the actual constituents which go to make up the rate.

State Differentials

When this process has been repeated for each of the classifications given in the manual, a complete system of net basic premiums for one state will have been secured. It now becomes necessary to extend the rates to other states. Naturally the same rates cannot be quoted in one state as in another, since the benefits which one state gives are not the same as those which are given in other states. Here the system of state differentials comes into operation. By this system the basic rates, which have been found are merely multiplied by a constant factor differing with each state, which is termed the state differential.

The state differential owes its existence to Dr. Rubinow, and its basis is sometimes called "Dr. Rubinow's Hypothesis." Dr. Rubinow's statement of the hypothesis is as follows: "Given a sufficiently variegated industrial activity, the distribution of accidents according to their physical results will be fairly uniform everywhere."¹ Using this assumption, Dr. Rubinow used accident gravity rates from available European and American experience to make what he has termed a "Standard Accident Table,"² to apply to American compensation laws. He has tabulated in this table the number of the various kinds of accidents to be expected in every 100,000 accidents occurring.

Summarized these are as follows:

Fatalities	932
Total permanent disability	133
Dismemberments	2,300
Other permanent partial disability	2,442
Total temporary cases	<u>94,193</u>
	100,000

In the actual table of course the various kinds of dismemberments are subdivided, as are the other permanent partial disability and the temporary cases.

¹Scientific methods of computing compensation Rates, Proceedings of the Casualty, Actuarial, and Statistical Society, November 7, 1914, page 18.

²I. M. Rubinow, A Standard Accident Table as a Basis for Compensation Rates, New York, the Spectator Company, 1915.

If the assumption be accepted as correct, all that is necessary to compute a state differential is to multiply the number of each of the classes of injuries as given in the Standard Accident Table by the average present value of the benefit granted by the law in question, add to find the total, and divide by the corresponding value as found by applying the table to the basic state. The result will give a factor which is to be used as a constant multiplier to find the basic rates for the second state.

Just how correct Dr. Rubinow's assumption is, and how accurate are the results which he has gained in its application to existing statistics, it is too early to judge. In his compilation of the table, Dr. Rubinow labored under extreme difficulties. Statistics as they have been collected in the various countries, have not been reported uniformly. Neither were they extremely accurate in many cases. There is little doubt that Dr. Rubinow compiled as good a table as could be obtained with the data at hand, but it would not be surprising should experience show many of his values to be rather wide of the mark. The table below will give some idea of how closely the standard table has checked with the distribution of accidents in New York. The New York data are obtained from an analysis of 10,307 accidents reported to the New York Insurance Fund during the year ended June 30, 1915.¹

¹ Joseph H. Woodward, Analysis of the Cost of 10,307 Accidents Arising under the New York Compensation Law, Proceedings of the Casualty, Actuarial, and Statistical Society, February 25, 1916, page 201.

Both tables are reduced to terms of "compensatable" accidents. (A "compensatable" accident in New York is one in which disability continues fourteen days or longer.)

	<u>Rubinow's Table</u>		<u>State Fund Experience</u>	
	Actual	Per 1000 "Compensatable" accidents	Actual	Per 1000 "Compensatable" accidents.
Fatal cases	932	24.1	83	33.6
Dismemberments	2,323	60.0	234	90.7
Permanent total disability	110	2.8	5	2.0
Permanent partial disability	2,442	63.0	2	0.8
Temporary total disability, two weeks or over	32,949	850.1	2,155	872.9
	38,756	1,000.0	2,469	1,000.0

"The almost total absence in the New York figures of permanent partial disabilities other than dismemberment appear to be due in part to differences in the administration of the law as compared with the practise in European countries whose experience formed the basis of Doctor Rubinow's table. ---The greater number of fatal and dismemberment cases in the State Fund Experience is possibly due in part to a greater preponderance of hazardous classifications in the exposure."¹

Even if the fundamental assumption of the hypothesis is correct, it is a question whether the industrial activity in

¹ Joseph H. Woodward, Analysis of the Cost of 10,307 Accidents Arising under the New York Compensation Law, Proceedings of the Casualty, Actuarial, and Statistical Society, February 25, 1916, page 201.

the various states is diversified enough to make the rates such that the total premiums and losses of each state will bear a constant proportion to the total premiums and losses in every other state. More doubtful, still, is it as to whether the table will do justice to the individual classes within the states. If the assumption is correct for industries as a whole, there is no question that it will not apply absolutely to one industry as compared with another industry. Thus the differential should be different for every industry for which we desire a basic rate. With the present condition of the data at hand such a differential for every industry is impossible, but is applicable within a few industries.

While the new manual issued by the Augmented Standing Committee is based on the general assumption that the hazard in a given industry is the same thruout the country, and an application of state differentials is made, it was realized that the hazard in all industries in a given state would not bear the same relationship. For this reason "state exception sheets" were issued in those cases where the application of a constant differential was considered inadvisable.¹

One can readily see that the ideal would be that each state should have an experience sufficient to obtain its rates solely from its own data. In this case the system of state differentials would be unnecessary, since the rates would be

¹Fire, Casualty, and Miscellaneous Section of the Spectator, April, 19, 1917, page 35.

computed directly. Probably this ideal will never be realized, at least in most of the industries in the majority of the states. Some system of combining the experience of the states and of state differentials will be essential. What may be hoped for, however, is that differentials for the more important industries will be formulated, and also that a standard accident table, similar to Dr. Rubinow's table, but founded on data from American experience, will be available for industries which do not have their own differential. Such an extended system of state differentials would insure much greater equity between the larger industries, and between the several states. Those employers who represent the smaller industries of the country might not be as equitably dealt with as would the larger industries, yet the amount which they would gain or lose would be an extremely small percentage of the total payment for compensation insurance.

III. THE GROSS PREMIUM

If the rate-maker were satisfied that the computation of the net premium for each of the basic classes represented as nearly as possible the actual cost to be expected from the compensation of injured workmen and their dependents, together with payments to be made for medical attention, the actuarial part of the work of establishing basic rates would be complete. All that would then remain would be the consideration of those elements which are purely a matter of business and business methods.

That the rate which has been found does not make an accurate estimate of the expected cost is due to two sets of factors. The first of these is concerned with variations in the pure premium as it has been defined,¹ while the second is dependent on inaccuracies in the net premium. It thus comes about that an addition must not only be made to the net premiums to cover the business^{expenses} of insurance, but also to cover adjustments in the basic premiums.

These two sets of factors--the adjustments which must be made in the basic premium and the business costs of the insurance--are provided for in what is known as the loading.

This is defined, as it is in life insurance and fire insurance, as an addition which is made to the net premium, either in the

¹See page 13.

form of a percentage or a sum in dollars and cents to arrive at the rate which is quoted in the manual--the gross premium.

The matter now at hand is to consider to some extent these two classes of elements which make up the loading, and to show that each set must be taken into account in order to secure a gross premium which will be sufficient to cover all the costs of the insurance.

Loading to Correct Variations in the Pure Premium

Even if there were no question that the net premiums of each of the basic classes, as computed, reflected exactly the pure premium for the class, provision for certain additional factors would still be necessary that the amount might be adequate to meet the expected losses. The definition of the pure premium read "the actual cost, within fluctuations due to chance or random sampling." In workmen's compensation insurance the actual cost is not a constant amount for a given risk, even within chance fluctuations. It varies greatly from time to time. The pure premium of a class in 1917 may be markedly different from what it was in 1916.

The first of these variations has been before denoted as that due to the pronounced cyclical tendency which workmen's compensation experience displays. In years of extreme prosperity plants are worked overtime, new workmen are employed to run machines with which they are unfamiliar, and an atmosphere of hurry and unrest pervades the industries. Such a condition leads to an increased accident rate. The accident frequency in times

of depression should not be used to measure the hazard in times of industrial activity, nor should the frequency during a period of prosperity be used as a basis for rates in a time of depression. The statistics of a period of average activity would more nearly represent the probable cost, but they would underestimate the number of accidents in prosperous years, and overestimate the number in years of depression. As an account of the cyclical factor has not been taken in the computation of the net premium it must be provided for in the loading.

Another cause of change in the pure premium is to be found in the effect of a more complete use of the benefits of the workmen's compensation act as the law becomes older. As was shown above¹ there has been exhibited in foreign compensation acts a well-defined tendency for the accident rate to increase--not the actual number or severity of the accidents--but the number of reported accidents. The same causes that have acted to bring about an increase in the rate in foreign countries may be expected to operate in this country, and a corresponding increase may be anticipated in this country. The rising cost of compensation in New York, as before stated, has furnished a striking illustration of this tendency.

When an act is new the average workman is unfamiliar with its provisions. He is very likely to get the idea that he would have the same difficulty in getting damages that he had under the old employers' liability laws. Especially will he

¹See page 21.

think that it is useless to report cases of temporary disability which last only a few weeks. He will get along without medical attention, when under the terms of the act he is entitled to the care of a physician. All this is changed when the act has been in force a short time. Now the workman, instead of not reporting accidents for which he might have given notice, reports accidents for which he should not receive compensation. The acts in force are designed in the most cases to prevent employes from reporting accidents which are really not compensatable, and extending a disability which would come within the waiting period to a time outside the period. However, it is doubtful whether any of the acts of the United States will altogether prevent the evil of simulated disability, or malingering, as it is called. Moreover, there is a growing tendency to interpret the provisions of the law more liberally, and to grant injured workmen a larger amount of compensation.

A third cause which renders the pure premium subject to variation is the rapid change in industrial processes and the introduction of safety devices. While it has been stated that ten years is the longest time for which accident statistics can be used in rating the great majority of risks, even in a period of this length, there will be a considerable number of cases in which radical changes have been introduced, and in which new inventions furthering safety, and new industrial standards will have been installed. Although this cause of variation may counteract to some extent the effect of the other causes of change it appears better to take it into account as a sort of

negative loading.

These three causes of a variation in the pure premium are the most important that operate upon it, but they are by no means the only ones. However, if cognizance is taken of cyclical variations in the pure premium, the increasing cost of compensation with a longer application of the law, and the rapid change in industrial conditions and processes, provision will have been made for those factors which have the greatest influence. It is not now, and probably never will be possible to estimate accurately the total effect of these elements, not their relative effects, changing as they necessarily will from time to time, and from industry to industry. All that it is now possible to do, and all that it may ever be possible to do, is to place a conservative estimate on them, deriving the estimate from past experience, present judgment, and probable future conditions. It must be admitted, however, that as time goes on, as statistics become standardized, and as the exposure becomes greater, the influence of these variations will become less and less, and may even reach the point at which they may be almost totally neglected for practical purposes.

Loading to Correct Inaccuracies in the Net Premium

Assuming, now, that the net premium has been so loaded that the changes to be expected in the pure premium are included in it we proceed to the class of adjustments to be made in order that the net premium may more closely approximate the adjusted pure premium. Aside from the inaccuracies which have been

incurred because of the inadequacy of the statistical data, which have been at least partly eliminated by an application of underwriting judgment, supplemented by a mathematical formula, certain others must be considered.

The first class of these may be called the deviation due to the underestimate of outstanding claims and estimated losses. It will be remembered that the statistics by which premiums have been computed are based on the experience of the various states having workmen's compensation laws. As none of these laws has been in effect over six years, and as most of the statistics apply to the experience of the last two or three years, much of the cost as shown in the data furnished applies to an estimate of outstanding claims and losses. It seems that the tendency of human nature when it comes to figuring the probable cost of accidents is nearly always optimistic. Men will think that a workman who is disabled will recover quickly, and that one who appears to be on his deathbed may survive. Also, in their application of underwriting judgment they will figure that losses in the past have been due to abnormal conditions, and in their computation of premiums will lower the rate. Such underestimates must be taken care of in the loading in order that the premium may be sufficient to cover the losses incurred.

The second class of inaccuracies is one which is often neglected but which Claude E. Scattergood mentions in his article on the "Synthesis of Rates for Workmen's Compensation."¹ Mr. Scattergood refers to it as the "Accident frequency differential." As Mr. Scattergood points out, as long as the basic

¹Economic World, January 8, 1916, page 56

manual is formed from the experience of the old Massachusetts rates, or is a composite of the rates of various states, there are bound to be inaccuracies in its employment by means of a law differential for other states. Data from the experience of the Fidelity and Casualty Company, which have been kept since 1889 for accidents as related to the payroll for industries within the individual states, show that the accident frequency for a given classification is generally higher in the western states than in the eastern states. The net premium, while it may be a true average of the total data, may yet be a considerable distance from an average for each state.

A third item to be considered is the catastrophe hazard. A catastrophe is defined as an accident the compensational cost of which is \$25,000 or over. The occurrence of catastrophes is such an uncertain factor, and the cost is often so great when they do occur that the item is usually treated separately. As it is recognized that the catastrophe hazard does not follow the general industrial hazard, loading for it is not made as a percentage of the premium, but as a certain charge in dollars and cents. Like the conflagration hazard in fire insurance, the catastrophe hazard is one of such uncertainty and of such importance that none except larger companies cares to bear its burden alone. It is customary to reinsure to meet this risk, sometimes in an association of the various companies, as is mentioned later.¹ In this manner the effect of a catastrophe does not fall solely on any one company, and its cost becomes

¹ See Chapter on "Adequate Rates and Reserves, page 93.

much more widely distributed.

It is generally considered necessary to incorporate in the loading a fourth item that comes about thru an application of merit rating, a definition of which is given in the next chapter.¹ Just how large an inaccuracy will be caused by the application of each of the number of merit rating plans that is in operation is problematical. As the plans become more perfected the effect should become less and less. It is, however, an item which must not be forgotten.

The inaccuracies in the net premium which we have mentioned are the most important to be considered. These, together with the variations in the pure premium must not be lost sight of, or the cost of the insurance is very likely to exceed its computed amount. As to the treatment of these various elements of hazard, it is of small moment whether each is considered separately or whether all with the exception of the catastrophe hazard are lumped into one charge.

After the net premium has been loaded as has been indicated, what will be termed the adjusted net premium will have been obtained. Such usage may not conform to accepted terminology, but it at least has the advantage of being self-explanatory and consistent with the terms previously defined.

¹
See page 67.

Loading for Expense and Profit

After the actuarial task of the computation of the adjusted net premium has been finished, a consideration must be made of the loading proper--the loading for expense and profit. Its determination and its amount lie at the base of the most discussed question of workmen's compensation today--the comparative advantages of stock companies, mutuals, and state funds.

It is obvious that there are expenses to be met in the operation of the business of workmen's compensation insurance. While some of the laws provide for the payment of the expenses of the state funds by the state, at least for a limited time,¹ some of these expenses will ultimately have to be met by all forms of organization. Others are incident to one form and are not present in another. The expenses of both kinds are expressed as a percentage of the gross premium, and not as a factor applied to the net premium.

Of the expenses which must be met by all organizations the first is general administration expense.² With the stock companies the average general administration expense, which consists of payroll audits and other administrative expense, is estimated to be about nine percent of the gross premium. Payroll audits consume two percent, while other expenses amount to seven percent. It will be remembered that the custom in workmen's compensation business is to base the premium on the amount of

¹The expenses of the New York fund were met by state appropriation until January 1, 1917, while the state of Pennsylvania is to pay the general expenses of the Pennsylvania Fund until July 1, 1919.

²The classification and estimated amounts of the various expense items are those given in the Report of the Committee on Loading and Differentials of the Joint Conference of 1915.

the yearly payroll, and to make adjustments for deviations of the actual from the estimated payroll. The actual amount is verified at the end of the policy year by an audit made by the company. The other expenses include such items as are generally incorporated in the term "administrative expenses."

The second item of those which all forms of organization must meet is that of service expense. This requires an average amount of eleven percent of the gross premium in the case of the stock companies, and consists of inspection and accident prevention, which require four percent, and the investigation and adjustment of claims, which consume seven percent. The amount spent for inspection and accident prevention is one that should not be reduced in any event. If one of the objects of workmen's compensation insurance is to prevent accidents, then an extensive program for accident prevention should be undertaken. The insurance companies are well qualified to carry on this work, and should be allowed a remuneration for it which will enable them to carry on a really effective campaign. As far as inspection is concerned, it is so closely bound up with accident prevention that it can scarcely be separated from it.

The investigation and adjustment of claims is an item of expense that cannot well be disposed of. Investigation of claims is essential in order that the nature of the injury may be determined and its probable duration estimated. A certain adjustment expense is necessary in order that unscrupulous laborers may not get more than they are entitled to, and that

workmen who really deserve compensation may receive it.

The sum of the items of general administrative expense, service expense, and the investigation and adjustment of claims, gives a total of twenty percent that must be met by all forms of organization alike. If there is any advantage to be gained by any form over the other two, it probably lies with the stock insurance companies.

Next a consideration is to be made of those forms of expense in which one form has an advantage over another. The first of these items is that of "taxes, licenses, etc." With the stock companies the amount of this charge is estimated at about two and one-half percent of the gross premium. Mutual companies must meet the same cost, but the state funds, thru the manner of their creation by law, are exempted from a payment of taxes. Thus the state funds have at this point a considerable advantage.

The second and most important item that does not fall upon all forms of organization alike is that of acquisition expense. For the stock companies this is estimated at seventeen and one-half percent, while state funds and mutuals spend very little for the acquisition of new business.

Stock companies seem to be irrevocably committed to the agency form of operation. It is the method which is employed by life insurance companies, and that which is used by fire insurance companies. Agents must be paid for their services an amount which will keep them interested in workmen's compensation, will cause them to push the business, and will make them willing

servants of the company. Seventeen and a half percent does not seem excessive for the services of an agent on an ordinary sized risk. Whether a reduction of the percentage could be made in case of larger risks is open to argument. Commissioner Phillips of New York recommends that a commission of only ten percent be allowed in New York in the case of the larger premiums. In England a diminishing percentage plan is in operation with considerable success. The companies themselves do not seem to think that they can reduce the commissions of their agents. They consider that the agent is at present paid as little as is consistent with the quality of his work.

The question to be answered is whether the item of commissions makes the cost of insurance in stock companies so high that the companies will not be able to compete with the insurance of state funds and mutual companies. The stock companies claim that the added service obtained, and the greater degree of security offered thru their strong and well-established organizations more than counterbalance the additional cost. State funds and mutuels maintain that they can furnish compensation at a lower cost and with equal service and security. At this early stage in compensation history, it is almost impossible to make any conclusions as to which form is most likely to endure. Perhaps one cannot do better than to show in what ways the business of compensation insurance resembles that of other forms of insurance, and then to point out how the insurance system of these other forms has developed.

The reasoning may be based on the analogy to life insurance and to fire insurance. In life insurance both stock companies and mutuals exist side by side. The amount of state insurance is so small that it may be totally neglected. The same argument that has been employed in workmen's compensation has been used in life insurance to prove the advantages of the mutual system. Yet stock companies are able to compete successfully with the mutual companies. One must, however, recognize one very salient point of difference between life insurance and workmen's compensation in this respect, which is to be found in the difference in their organizations. Life insurance mutual companies are associations composed of a great many individuals, each interested only to the extent of a few thousand dollars of insurance. The mutual in workmen's compensation is made up of a number of employers, most of whom hire a large force of laborers, and insure a large risk at a considerable cost. Each employer becomes directly interested in the insurance project, and in the management of the business. He inquires closely as to the cost of the insurance and sees to it that the business is carried on in a manner in keeping with his ideas of modern business methods. Another difference, while it springs from the former, is even more marked. This is in the matter of acquisition expense. In life insurance the mutuals, like the stock companies, employ the agency system. A mutual life insurance company, as well as a stock company, employs a corps of progressive agents to perpetuate its existence and enlarge its business. In workmen's compensation there is a growing tendency to make insurance compulsory, and in

theory, at least, employers will see the saving in commissions to be made in the mutual form, and will not have to be prevailed upon to insure by agents.

If the analogy to the life insurance business is not close, one may inquire to what extent workmen's compensation resembles fire insurance. Nearly every employer sees the necessity of carrying fire insurance. In this respect it resembles the compulsory nature of workmen's compensation. A dual system of stock companies employing agents and of mutual companies has been developed in fire insurance. The comparative amounts of business done by stock fire insurance companies is much greater than that done by mutual companies. The commissions of agents in fire insurance are as great or greater on the average than those given in workmen's compensation. The fact that more mutual companies have not been started in fire insurance is one very strong argument in favor of stock company insurance in workmen's compensation. It must be admitted, however, that the experiment in fire insurance is not at all conclusive, nor the analogy so complete as to render a valid conclusion possible as to the superior advantages of the stock company system in workmen's compensation. Nevertheless, it would at least point to such an inference, and lead one to predict that stock companies would be able to survive the mutual competition.

Even with the experience of life and fire insurance as an aid one cannot conclude anything definite as to the character of future compensation insurers. Which form, if any, will prove to be dominant can hardly be predicted. If the tendency to

monopolistic state funds continues, there will be no doubt about the outcome. If the states decide to withdraw from the business of workmen's compensation insurance, the field will be left to the private mutuals and stock companies. If all three forms are allowed to exist, unhampered, competition between the three should determine which is the more effective form.

The states must see to it that competition, if it is to be allowed, is fair. At least this much is within the province of the state. The laws must be such that if all three forms of insurance are permitted one shall not have an undue advantage legally over another. Whatever advantage is to be secured should be an advantage due to superior business organization. If fair play can be guaranteed^{and} that destructive competition which reflects not only on the organizations doing the insurance business, but also on the insuring employers and the insured workmen, be prevented, the ideal system as far as the organization of the business is concerned will be secured.

At the present time the stock companies write a much larger total volume of business than do either the state funds or mutuals. The following are the premiums given for 1916:¹

Stock companies (46 companies)	\$47,995,283
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Mutual companies (27 companies)	8,257,534
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The amount received in 1916 by the state funds is not yet available, but since the total in 1915 was about \$7,600,000

¹Taken from the Fire, Casualty, and Miscellaneous Section of the Spectator, April 19, 1917, page 27.

the premiums received in 1916 by state funds probably amounted to about \$10,000,000.

These figures, taken by themselves, are likely to prove deceptive. One might infer from them that the stock companies have almost a clear field. Such is not at all the case. The competition of state funds and mutuals is very active. The casualty companies were first on the scene. They had developed an intricate organization for liability insurance, and it was an easy step for them to enter the business of workmen's compensation insurance. Mutual companies, to the contrary, are practically a development since the creation of workmen's compensation laws. Mutual organizations cannot spring into prominence in a day. Time is necessary to perfect an organization, interest employers, and to live down the implications of unscientific methods and probable future insolvency placed on them by the stock companies. So it is with the state funds. Many of the state laws do not provide for the creation of a state fund at all. In those in which the state has entered into the field, the fund has labored under the difficulty that it has started a new business, and the adequacy of its rates and its solvency have been challenged even more often than in the case of the mutual companies.

Further, one must not lose sight of the fact that the business of workmen's compensation has not proved generally profitable to the stock companies. For proof of this one need only note the number of companies that have withdrawn from the business of workmen's compensation within the past few years.

Also, it has been recognized in preparing systems of loading that the business is in such a condition that the casualty companies cannot incorporate in their premiums any provision for profit, but must make whatever gain they are able thru savings in their loss ratio or in economies in management.

Leaving, now, the question of the form of organization, and assuming that it has been decided that the stock companies will be able to carry on their business at an average expense ratio thruout the country of forty percent of the gross premium, the territorial deviations from this average must still be settled. The rates in those states whose laws are more liberal do not require such a large percentage for expense loading as do those which allow smaller benefits. There are certain expenses which are more or less constant; i.e., do not vary with the benefit rate. For this class the expense loading, expressed as a percentage of the gross premium, should be proportionally smaller in the states giving more liberal benefits. The other class of expenses--those which vary with the premium collected--do not need to enter into the variation in the loading.

The following table gives the total percentage of expense loading which was adopted by the Joint Conference of 1915:¹

¹See the Proceedings of the Conference, page 36. This list includes only those states in which the companies could carry on business at that time, (1915).

State Groupings

Group I	Group II	Group III	Group IV
Loading 42½%	Loading 40%	Loading 37½%	Loading 35%
Colorado	Connecticut	California	New York
Indiana	Illinois	Massachusetts	
Iowa	Maryland	Ohio	
Kansas		West Virginia	
Louisiana		Wisconsin	
Maine			
Michigan			
Minnesota			
Nebraska			
New Jersey			
Oklahoma			
Pennsylvania			
Rhode Island			
Vermont			

The Manual Rate

All the elements which go to make up the manual rates have now been discussed. As the process has been described a net premium is computed from available statistical data, supplemented where necessary by the application of underwriting judgment. To make sure that this net premium shall be sufficient to pay the claims which will arise under it, an additional factor of loading is introduced to cover the variations in the pure premium, and another to cover inaccuracies in the estimate of the pure premium. These variations and inaccuracies are taken care of by a percentage factor, except in the case of the catastrophe hazard, where the premium is loaded by a factor expressed in dollars and cents. Provision is then made for the various expense items, but for these the loading is expressed, not as a percentage of the net premium, but as a percentage of the gross premium. Whatever profits are to be made must, at

present, come from savings in lose ratios, or in economical management.

The combination of all these elements forms the manual rate for each classification. The rate is expressed mathematically in terms of all its elements. The formula

$$\pi = 100 \left(\frac{L_1}{P} + \frac{L_2}{P} \text{ ----- } \frac{L_r}{P} \right)$$

where π is the net premium, L_1 , L_2 , ----- L_r the losses from each class of injuries, and P the payroll, has already been given.

The following formula gives an expression of the gross premium, or manual rate:

$$M = \frac{\pi(1+v)(1+i)}{1-E} + C$$

Here M represents the manual rate, $(1+v)$ the factor to provide for variations in the pure premium, $(1+i)$ the provision for inaccuracies in the net premium with the exception of the catastrophe hazard, which is expressed by C , and E the loading for expense.

After the terms of the formula have been calculated and combined into one single amount the manual rate for the classification is obtained, expressed in dollars and cents per \$100 of payroll. Since there are some 1500 different classifications, each of which must have its rate, and thirty-seven states for which to establish rates, no one of which gives exactly the same scale of benefits, one can see the magnitude of the task of getting gross premiums, and will realize the wonderful work that has been accomplished in establishing manual rates.

But even when the task of computing manual rates has been completed; even when rates have been provided for each of the 1500 classifications in each of the thirty-seven states which have workmen's compensation acts, the rate is still not the one that would be quoted to individual employers. Even now the process has not been brought to a degree of refinement that is in keeping with modern ideas of workmen's compensation insurance. While the manual rate provides a rate for the average risk of any given class, the hazard of very few plants corresponds to this average. Thus further considerations are necessitated, which are discussed in the next chapter.

IV. MERIT RATING

Theory of Merit Rating

Merit rating may be looked upon as a method by which the principle of mutuality in insurance is restricted in its application, and individuality becomes a predominant feature in rate-making. Life insurance started out with the idea of mutuality applied to its fullest extent. In the early organizations no account was taken of the age of the insured. All members of the society paid the same amount into a common fund. Such a broad application of the principle proved too extensive, and at present mutuality in life insurance stops at a given age group. There is not within the groups of normal men of a certain age and in ordinary occupations any subdivision. Any man who can pass the physical examination is rated the same as every other. The only differential that is employed is a charge in the case of those men known as substandard risks. There is not one rate for a healthy farmer, and another for a city clerk; one for an athlete and another for a man having sedentary habits. In workmen's compensation, however, there is a constant tendency, at the present time, to make the rate fit as closely as possible the individual hazard. As before stated, the manual in use by the National Workmen's Compensation Service Bureau contains some 1500 classifications. Even such a subdivision of the risks does not seem sufficient. When men insure their own lives they

do not appear to ask minutely about the cost. When they insure the lives and faculties of others, they want to pay only for insurance upon their own risks, not to help pay the insurance for others.

Here is one object of merit rating--to make the premium reflect as nearly as possible the hazard of the individual risk. Another object, and one which, from the viewpoint of the community, is very important, is the incentive to accident prevention. If the employer is offered pecuniary reward for making his plant safer, or is penalized if its safety is not up to the standard, his desire to reduce the number of accidents in his establishment in most cases immediately rises.

It may be said that a good merit rating system, as it is conceived today, is one which fulfills two conditions: first, that it reflects the individual hazard, and second, that it encourages accident prevention. The first of these criterions may, in the light of future developments in workmen's compensation insurance, become less important, but the second criterion, viewed from the standpoint of present day humanitarianism, must continue to be an important adjunct of the system.

Merit rating in workmen's compensation insurance is borrowed directly from the practise in fire insurance, where systems of differential rating have been used for a long time. To workmen's compensation insurance, however, is due the euphonious title of "merit rating," which characterises very well the actual system.

There have been developed within the last few years

two main forms of merit rating in workmen's compensation. The first of these is called "experience rating," while the second is termed "schedule rating." Each form has much to commend it, and each has some defects. Each is put forth with great enthusiasm by its exponents and criticised severely by those who uphold the other plan.

Experience rating is a form of differential rating between plants of a given classification in which the experience of one individual plant as compared with a standard plant is made the basis of the difference in the rate. The assumption underlying schedule rating is that the rate should be influenced by the use or non-use of physical safety devices, the construction of more modern factories, and the maintenance of an approved system of safety organization. Both forms of merit rating assume that a proportion of accidents are preventable, and that plants where care is used to prevent accidents, and where accidents are actually prevented, should not be required to pay as large a premium as plants where the same precautions are not taken.

As mentioned by Mr. Carl Hansen¹ there are three main forms which either experience or schedule rating may take. First, one may assume a hypothetically perfect plant and charge

¹Development, Application, and Effect of Schedule Rating in Liability and Compensation Insurance, Proceedings of the Casualty Actuarial, and Statistical Society, May, 1915, pages 219-220.

all plants which do not come up to this standard a higher rate; second, one may base rates on an average plant, make an additional charge to those plants below it, and credit those which are estimated to be a better risk; third, one may establish a system of credits only, in which case a very poor plant would be assumed hypothetically as a basis.

Like the other controverted features of rate-making, there has been considerable written about these two forms which merit rating has taken. While much of this writing is colored by the feelings of the writer on the subject, there is a wealth of material to be found on the description and operation of various merit rating systems. For this reason, it was thought necessary to make only a brief survey of the field, and to give merely a short description of a few of the more prominent examples of the two classes.

Experience Rating

Experience rating was the first of the two forms to be developed. As early as 1911 the Ohio State Fund put into use a crude form of merit rating from experience. Today the method of the Ohio fund is one of the best and most completely applied systems of experience rating. The Ohio plan is an application of experience rating by the first method; namely, a hypothetically perfect plant is assumed. Under the Ohio system the basic rate is the minimum rate, and each employer is charged a greater or less amount above this rate, depending on the past experience

of his plant. As is stated in the description of the Ohio plan¹ a certain number of accidents are unavoidable. For this reason, there is taken into account what is called the "Trade Hazard Factor Allowance" for each classification, which averages about forty percent of the basic rate. No medical cost is involved in the factor, as it is cared for in the remaining sixty percent. Next, an injury is defined as "the equivalent of ten percent of the trade hazard factor allowance established for the classification of the risk." A death counts as ten injuries while a permanent disability is counted as fifteen injuries. As long as the charges of an employer do not exceed his trade hazard factor allowance, he receives the basic rate. If his cost does exceed the trade hazard factor allowance, a charge of three percent is made against each injury in excess. The total charge may not exceed twenty-four percent in any given period of six months.

In New York a revised plan of experience rating was placed in effect on June 30, 1916, which is used in combination with the schedule rating plan of the National Workmen's Compensation Service Bureau outlined below. Under this system² all manufacturing risks with a payroll of at least \$100,000 and an earned premium of \$500, as well as contracting and miscellaneous risks with a minimum payroll of \$5000 and an earned premium of

¹See Merit Rating in Workmen's Compensation, by Emile E. Watson, Economic World, May 6, 1916, page 601; also the Ohio State Insurance Manual Number 4.

²A description of the plan and the rules governing its application are given in a pamphlet issued by the Compensation Inspection Rating Board of New York.

\$500 must submit to experience rating. The possible size of the debits or credits depends on the loss ratio of the risk and the size of the premium. For a premium of \$500 a maximum of five percent is specified, while for a premium of \$5000 or over twenty percent is the maximum. If the loss ratio of the risk in question is between forty percent and sixty-five percent, no credit or charge is made, as these limits bound what is known as the "neutral zone."

The plans now in use have been criticised on the grounds that an employer is very likely to be severely penalized because of a serious accident, while as a matter of fact the seriousness of the accident depends wholly on chance, and not on the nature of the plant or its morale (the moral hazard involved in the risk). To obviate this defect, a plan of experience rating has been proposed by Mr. D. S. Beyer, which goes on the assumption that while the severity of accidents is no measure of the hazard of a given risk within a classification, accident frequency does furnish such a criterion, and that the charge or credit (the system proposed is an application of experience rating by combined charges and credits) should be based wholly on the number of compensatable accidents in a given plant as compared with other plants in the same classification.

The following formula, given by Mr. Beyer,¹ and modified

¹See Experience Rating vs. Schedule Rating in Workmen's Compensation Insurance, by D. S. Beyer, Economic World, February 10, 1917, page 204.

by Mr. Winfield W. Greene shows the application of the method:

$$\text{Charge of Credit} = \left(1 - \frac{F'}{F}\right) .10 R$$

(in cents)

where F' is the frequency of accidents of the risk to be rated, F the frequency of the basic classification, and R the basic rate. Since the method is to be used in connection with schedule rating plans Mr. Beyer considers that ten percent is the greatest increase of rates to be made over the basic classification. It will readily be seen that a credit will result in case F' is smaller than F , while a charge will be made when F' is greater than F .

Mr. Beyer's method appeals to one as being a logical improvement on existing methods of experience rating, since it can readily be seen that in the operation of present plans even severe accident in a small plant will cause a large charge to be made in the employer's rating. As Mr. Beyer points out, a given accident may in one case cause a death or a permanent injury, in another only the loss of a few days' time. In the first case the employer will be penalized heavily, in the second his charge will be light. By the new method, the charge would be the same in both instances.

There is little doubt that there exists a moral hazard in connection with various risks. Two plants may have exactly the same physical equipment, yet one may consistently have more accidents than the other. For this reason, it is essential that if a rate which will, in both cases, reflect the individual hazard is desired, the two plants must be given a different rating.

One must, however, in rating, be sure that the one plant is not given a credit and the other penalized when as a matter of fact the vagaries of chance have been at work. It seems that there is no way to measure the morale of a plant except by some form of experience rating. Obviously schedule rating, which takes into account only physical conditions, cannot do so. The morale must, then, be measured by experience rating in such a way as to secure an accurate measure not only of its total effect on accidents, but also to distribute the credits and charges in such a manner that each plant is treated equitably. Mr. Beyer's method, if it does not measure the morale exactly, at least does not overestimate its effect. If we cannot be altogether accurate in rating risks for workmen's compensation, at least we should err on the side of safety. Further, the hypothesis that accident frequency is a fair method of estimating the comparative morale of plants appears sound. Judged from these standpoints, the method appears to be an improvement on any form of experience rating now in use.

Schedule Rating

While the morale of a plant has a marked effect on its accident rate, physical factors are a more important group of causes. Moreover, the existence of an efficient safety organization, modern safety devices, and well built factories aid the morale as well. Employes and employers who give attention to physical elements become imbued with the mental attributes which tend toward added safety. Of course this proposition cannot be

put forward as an inflexible rule. There are employers who obey the letter of the law but not its spirit, who install expensive safety devices, but who consider that their duty to their workmen and to the community stops at this point. This group is, however, in the minority. With the greater number the mere existence of physical elements of safety will better the moral hazard of the plant.

Although statistics have proved that safety measures have a marked effect on accident prevention, they have not thus far been able to show at all accurately the actual amount of accident prevention accomplished by physical devices, and the proportion of the total which each device contributes. As yet personal judgement has played a large part in the construction of schedules of charges or credits for safety devices. And as is to be expected the construction of the schedules and their application has not been altogether satisfactory, either from the standpoint of the employers who pay the premiums or the companies who must stand the cost of the accidents.

The Universal Analytic Schedule, prepared under the direction of Mr. Carl M. Hansen, of the National Workmen's Compensation Service Bureau furnishes an example of this state of affairs. While a wonderful piece of work, if judged in the light of an experiment with existing knowledge and statistics, yet in its practical application the schedule proved disastrous in many respects. Although purporting to equalize, by means of charges and credits, the hazards of the individual risks, and at the same time not to disturb the total premium of a classification,

as a matter of fact individual hazards were very imperfectly equalized. A net reduction of about ten percent of the total premiums was made in the first two years of its operation, while rates were reduced nearly twenty percent during the last year of its use.¹

The defects of the Universal Analytic Schedule led to the formation of a new schedule aiming to do away with the faults of the former. This schedule, known as the Industrial Compensation Rating Schedule, has been adopted as standard by the National Workmen's Compensation Service Bureau, and is in operation in practically all the states which use Bureau rates. It was charged under the Analytic Schedule that certain credits were given where the conditions did not justify them, and charges were not made where they should have been made. The present Schedule attempts to more nearly represent actual conditions, but its fundamental principles are very little different from those of the Universal Analytic Schedule. As with the earlier system the basic rate is that of the average plant and certain definite charges or credits are given the individual plant according to its physical characteristics as measured by the absence or presence of certain safety measures. The maximum charge or credit is not to be more than forty percent of the basic rate, nor is the total reduction in the amount of premiums to be greater than the total charges made upon other plants in

¹See The Practise of Schedule and Experience Rating for Workmen's Compensation Risks, by Leon S. Senior, Annals of the American Academy of Political and Social Science, March, 1917, page 266.

the same classification. The method of applying the charges and credits, which is the same as in the Universal Analytic Schedule, Mr. Hansen explains as follows:

"In practically all manufacturing plants there are three distinct kinds of accident hazards and the schedule should be so constructed as to properly distribute charges and credits in due relation to these hazards.

"The three hazards are as follows:

"First, catastrophe hazard such as due to the burning of buildings, collapse of buildings, boiler explosions, etc. The charges and credits applicable under this heading affect the entire payroll in the building and are to be applied on a flat basis to the rate.

"Second, the hazard incident to or inherent in the particular industry and affecting all employees. As the manual rate is computed to cover this hazard any reduction or increase in that hazard must have a corresponding effect on the manual rate. Therefore, charges and credits under that heading are to be on a percentage of manual rate basis.

"Third, the hazard incident to or inherent in the industry covered but to which only a limited number of employees are ever exposed at any one time, these charges and credits are to be on the adjusted-to-payroll basis."¹

Another form of schedule rating, and one that is in some respects the superior of the plan of the Bureau is that

¹Carl M. Hansen, A Brief Treatise on Schedule Rating for Workmen's Compensation Insurance.

which went into effect in the State of Pennsylvania on January 1, 1916. This method applies the system of combined charges and credits, but in a somewhat novel manner. Charges are applied for violations of physical standards, and are expressed in dollars and cents. On the other hand, there is a system of credits which attempts to measure the moral hazard. A system of percentages is used and in no case can the total credit amount to more than twenty-four percent. Just how accurate a measure of the morale of a plant can be obtained from more or less physical standards remains to be seen. At all events, credits given in the manner of the Pennsylvania plan, as outlined below, should be a great factor in accident prevention, and in the adequate first-aid treatment of accidents when they do occur.¹

Moral hazard percentage credits

1.	Organization, inspection, service and education		12%
a.	Organization and inspection service	6%	
b.	Inspection service	4%	
c.	Education	2%	
2.	Emergency hospital on premises		6%
a.	Dispensary with trained nurse	3%	
b.	Dispensary with attendant	2%	
c.	Sanitary room with attendant	1%	
3.	General Order and Cleanliness		6%
a.	Aisles and passages kept clear of obstructions	1%	
b.	Materials piled in orderly and substantial manner	2%	
c.	Light	1%	
d.	Sanitation	2%	
Total maximum percentage credits			24%

¹ The table is given in Merit Rating in Workmen's Compensation Insurance, by Emile E. Watson, Economic World, May 6, 1916, page 602.

Perhaps the most advanced form of schedule rating which has yet been employed is that used by the Associated Companies in the Coal Mining industry. In the main this plan is a form of schedule rating under the first method since a hypothetically perfect plant is assumed and a system of charges only is used. In making adjustments between states, however, the average for the industry as a whole is taken, and the state in question is given a credit or a charge from this average. The assumption of a hypothetically perfect plant in the coal industry is made possible by very good statistics which have been collected by the United States Bureau of Mines, and which show the accidents to be expected in mines where all possible safety devices are in operation.

In its practical working the plan is about as follows:¹

There are assumed to be ten classes of physical causes of accidents and two classes of moral causes. Sixty percent of the preventable accidents are assumed to be caused by the absence of physical preventative measures, and forty percent from lack of safety organization and safety measures. The twelve classifications are subdivided into a number of secondary causes. Each mine is inspected, and charged for the absence of each safety measure. Each charge is multiplied by the state weight of the charge, and the sum gives the total charge for a given mine.

This system is particularly good, first, because it is

¹For a more complete description of the plan see Inspection and Schedule Rating for Coal Mine Insurance, by Herbert M. Wilson, Proceedings of the Casualty, Actuarial and Statistical Soc., Oct. 1915, page 39.

based on adequate statistics, second, because there is no question under the method of charges only of collecting sufficient premiums and finally, because it takes account of a large class of causes of injury, not only of a purely physical nature, but also those of natural hazards of all kinds to which physical safeguards are difficult of application.

Combination Experience and Schedule Rating

An attempt has been made to point out a few of the most salient advantages and disadvantages of the two conflicting views of merit rating, and the methods in use have been illustrated by means of some of the more prominent applications of the two systems. That neither at the present time approaches the ideal at which merit rating aims seems obvious. Neither in itself affords a wholly equitable distribution of compensation costs between employers as concerns relative hazard; neither in itself offers the strongest incentive to accident prevention. Experience rating does not give the proper credit to employers who have in their plants effective safety devices, and is unjust in many cases to the small employer. On the other hand schedule rating but imperfectly gauges the moral hazard, and is not applicable to all risks. Such a state of affairs leads one to inquire whether at least part of the difficulty is not to be found in the inherent limitations of each system. If such is the case the remedy would seem to be found in a combination of the best points of the two systems into a new system which would be a composite of the two forms. If the cost of adminis-

tration of a system of this kind would not be excessive, it would have much to commend it in the light of present-day merit rating criterions.

Such a system might be outlined somewhat as follows: It would of necessity, because of the form of the accident statistics, be a system of credits and charges in the majority of cases. It would not be possible, at least with the great majority of classifications, to secure adequate statistics of the hypothetically perfect plant or of the hypothetically very poor plant. The system would be arranged in such a manner as to prevent granting credits where corresponding charges were not made. That has been one of the chief stumbling blocks of merit rating schemes in the past, both of the schedule and experience rating types. They have, in too many cases, offered a method by which unscrupulous agents have been enabled to get business from their competitors by cutting rates.

The first requisite of the system would then be that its credits and charges should balance each other, and yearly revisions should be made in the schedules from year to year to keep the sum of the deviations from the basic rate as near to zero as possible.

A second requisite would be that the physical hazard should be gauged accurately. Schedule rating alone appears to be able to accomplish this end. For this reason we would advocate an extension of investigations upon physical hazards to include not only manufacturing risks, but also as many other classes as possible. Until adequate statistics are at hand, it

will be unavoidable that the judgement of safety engineers should play a large part in fixing the comparative charges or credits. This judgment is, however, no mere guess, but is based on extensive knowledge, and is in most cases far more accurate than one would expect. In order that the physical hazard should be accurately gauged, an attempt would be made to estimate the total prevention of accidents that can be accomplished by physical means. Too high an estimate should not be made, for the rate would not correspond to the hazard. The estimate should not be too low since the incentive to the installation of safety measures would be lessened.

Then as accurate a gauge as possible of the moral hazard, or morale, must be obtained. This, as has been shown above, is better estimated by experience than by physical means. One bad feature of the plan, and one which it appears impossible to altogether obviate is that experience rating is not applicable to the small-sized risk. Here it would probably be necessary to use schedule rating only. However, in the present era of large scale production, the proportion to which experience rating is applicable is a comparatively large one.

As far as the experience rating part of the plan is concerned, the experience should be based on a rather short period of time, and the experience of each manufacturer revised from time to time. The suggestion of Mr. Beyer, to base the charge or credit on accident frequency rather than on accident gravity would appear to be of advantage not only because it would gauge the morale closer, but it would also make the system

applicable to smaller-sized risks, which is an end to be desired. Probably the maximum charge or credit should be placed between five and twenty percent, varying with the extent of the application of schedule rating, but in any case it should be well balanced, and leave the total premium to be collected from a given class the same as before.

A system such as outlined above should offer some very marked advantages over any that are at present in use. When two factions are diametrically opposed to each other, there is usually some merit and some fault to be found on each side. So with merit rating, if a compromise can be effected between the advocates of experience rating and the exponents of rating by schedule, retaining the best features of each plan, and discarding those that have proved bad, supplementing one with the other, one may hope to secure a composite plan which will work more efficiently, more equitably, and which will carry out better the humanitarian principle of workmen's compensation--the prevention of unnecessary accidents.

V. ADEQUATE RATES AND RESERVES

With the establishment and application of a system of merit rating, the actual rate-making process is complete. Use has been made of available statistical experience, supplemented by underwriting judgment where necessary, to secure premiums sufficient to cover the necessary costs of insurance, not only those actually to be incurred thru compensation awards, but also the expenses of carrying on the insurance business. Modified finally, by a form of merit rating, the rate to the individual employer reflects as nearly as is possible thru existing data and present knowledge his individual hazard.

It now becomes necessary to find some method by which the payment of the indemnity provided by law can be guaranteed. Safety is fundamental to any form of insurance. It is doubly important in the case of social insurance, since the indemnity afforded may be almost the only resource of the recipient. Workmen's compensation, as the most important kind of social insurance existing in this country, must be administered in such a manner that the injured workman will be compensated surely and quickly. There must be no question that the assets of the companies which write the workmen's compensation insurance are sufficient to meet all the claims that will be made for compensation awards.

To insure safety, control of two kinds is necessary: first, the premiums charged must be sufficient to cover all the losses they insure against and expenses which are incurred in carrying on the insurance business; second, the companies must be compelled to use the premiums as they are intended to be used, and not squander them thru excessive expenses and the declaration of dividends which have not been earned.

These regulations are necessary only for weak and badly-administered companies. Conservative and well-managed companies will not only appreciate the fact that rate-cutting is suicidal, but they will have accumulated a sufficient surplus to provide for possible insufficient premiums. It is for protection against the weak companies that stringent regulations are required. Just as the business of life insurance is written on a standard mortality table, and as reserves based on this table must be kept, so in workmen's compensation rates should be based on a standard manual, and sufficient reserves should be maintained. Such a system works no hardship on those companies which are financially sound. With those companies whose solvency is questioned security to the workmen and employers stands above the protection of the company.

Control to Insure Adequacy

If the principles involved in the process of rate-making are correct, and are applied accurately, rates will be secured which not only reflect the actual hazard of each risk insured, but an amount sufficient to cover the losses incurred

and the expenses of carrying on the business will be obtained from the premiums.

It may be laid down as a fundamental principle that rates should be sufficient in each state to pay expenses on business in the state under careful management, and to leave enough to pay all the losses that have been incurred. While it is advantageous that each risk should be treated equitably, it is more important that the total premiums should be ample. As the insurance is carried on at present under competitive conditions, little danger need be anticipated that rates will become too high, but rather there is danger that they will become too low.

There is a question whether enough dependence can be placed on the existing manual to require that all rates be based on it, since it is itself new and, further, its use is subject to wide variations due to the application of merit rating. The best which can be done, it seems, is to make sure that the rates under it are at least adequate, and as accurate as is possible, and then to compell the companies to abide by the manual. In life insurance most states specify that the American Experience Table of Mortality at three and one-half percent interest is to be used for the purpose of computing reserve valuations. It is generally recognized that the American Experience table gives for selected lives too high a mortality rate at the earlier ages. Again, under present conditions, most companies are able to earn considerably more than three and one-half percent on their investments. If life insurance recognizes that safety is to be

considered above extreme accuracy, it is even more important that workmen's compensation insurance should appreciate this fact also.

The manual of the Augmented Standing Committee, based as it is on the widest statistical experience available, and applied by men well qualified for the task, should prove to reflect actual losses very closely, with a sufficient margin of safety. It is probably safe, for the present, at least, to adopt it as standard.

The great difficulty encountered is in compelling the several companies to apply the rates to the various risks as they are quoted, modified only by the correct and accurate application of a recognized merit rating system. Although certain of the state laws specify that adequate rates shall be charged, such provisions are of little value unless some mechanism is provided for enforcing them. It would seem that some kind of a central bureau or inspection and rating board is essential in each state. In any industry where the cost is far from being accurately determined in advance there is likely to be a great deal of destructive competition and price cutting unless some form of combination is inaugurated. In life insurance costs are well enough known to serve as a protection against the cutting of rates. In fire insurance the expected costs cannot be nearly so accurately pre-determined. A company may delude itself into believing that it will not have its full proportion of fires, and will allow its agents to insure risks at less than their proper rate as measured by the average expected hazard. So in

workmen's compensation, where the cost of accidents is still a somewhat uncertain quantity, rate cutting is likely to be practised for competitive reasons.

Combination in workmen's compensation has taken two principle forms. The first of these is the purely voluntary kind of organization in which the various companies join together for their common advantage and protection. Examples of this form are the National Workmen's Compensation Service Bureau and the Associated Companies. The National Workmen's Compensation Bureau not only furnishes the rates for its member companies, but is provides in certain instances a method by which these rates are to be maintained. The Bureau has established branches at Chicago, St. Louis, and Louisville which are known as "stamping bureaus." Companies not members of the central Bureau, but which transact business in the territory served by a branch, may subscribe to the maintenance of the branch and share in its benefits. The duties of the stamping bureaus consist in passing upon the rates given by the various companies to individual employers within their respective territories. The rates are checked to ascertain not only whether each risk has been assigned to its proper classification, but also whether the premium collected is the correct amount as given by the manual rate modified by a proper application of the merit rating system in use.

The Associated Companies is a form of organization more closely knit than is the Bureau. The ten companies interested in the organization pool their earnings and share the profits or losses which result. The incentive to price cutting as between the various members is lacking, since the total profit and not

its distribution is alone the end sought.

The catastrophe hazard is so great, and conditions in the coal mining industry are so individual that a close form of organization of the companies transacting workmen's compensation seems imperative. In the field of workmen's compensation taken as a whole, it is very doubtful whether such a complete combination would be held legal under the anti-trust laws of at least some of the states. Be that as it may, the companies have not formed a more complete organization than that of the Bureau.

The National Workmen's Compensation Service Bureau is an effective agent for making rates, but it is questionable whether its scope can be made wide enough to include the proper maintenance of rates thruout the country. If the stamping bureaus prove effective, their number may be increased to include a wider territory, but the system is too new to prove whether or not the method is satisfactory. Moreover, the Bureau organization is open only to its members and to those companies which have become members of the branch offices.

If the rates are to be kept adequate for every state, it would seem that some kind of a state organization to maintain rates would be more effective. Thus arises the second kind of combination, in which the state is interested and which is sometimes formed at the instance of the state.

Mention has already been made of the state rating and inspection bureaus. Although this form of organization is of very recent development (it will be remembered that the New York Board formed in 1914 was the first to be organized) there are at

present seven in operation. These combinations consist of most of the insuring agents within the state, and are organized not only for the purposes of establishing a standard manual and a merit rating system, but also to inspect risks, determine the classification to which each belongs, and modify its rate by an impartial application of merit rating. It is probable that more of the boards or bureaus will be formed if their methods prove as efficacious and their results as desirable as have been indicated by the activities of those which are now in existence.

Reserve Requirements

When a system is established by which adequate rates are to be maintained, only half the necessary control has been exercised. It still remains to provide a method which will compell the companies to put the premiums to the use for which they are intended and not squander them by excessive expenses and the declaration of dividends that have not been earned. This kind of control is best gained thru a system of compulsory reserves, by which a sufficient part of the premiums collected are set aside to provide for the payment of awards as they come due.

Under insurance by stock companies it is imperative, and under the mutual form and with state funds it is the only logical system, that the premiums for each year be sufficient to pay for the total cost of the insurance. Life insurance at one time was largely upon the assessment plan, and the premiums collected were only sufficient to cover current losses. Theoretic-

cally such a system was sound, but practically it afforded some difficulties that rendered the plan unworkable. As long as the premiums were low, the system flourished, but when the men in the organization became older, the death rate rose, and along with it the assessments became so high that the remaining members would no longer pay them, and the organization failed.

So with workmen's compensation insurance, a mutual organization, whether a private mutual or a state fund, may require from its members only enough to meet current losses, thus saddling upon the future the payment of claims whose whole cost is not incurred in the year of issue. Private mutuals working under this system will not be able to secure in the future, since the cost will rise to such an extent as to be greater than in the stock companies. The members in the organization will gradually withdraw, and the company will not have enough assets to pay the claims as they mature.

It might be feasible for a state fund having a monopoly within a state to operate under a current loss system.¹ Here employers have no choice but to insure in the fund, and must pay its rates, whether they rise rapidly or not. The difficulties in this case are three: first, the rate may become so high that industries in the state will not be able to compete with the same industries in other states; second, the rising rates may cause such opposition to the law that its repeal will be brought about; third, so much question may be brought about as to the

¹Compare E.H.Downey, The Organization of Workmen's Compensation Insurance, Journal of Political Economy, December, 1916, page 963.

actuarial soundness of the system that the fund will not have the feeling of security that a system of workmen's compensation should have.

Practically, the only system to adopt in any case is one which operates on the capitalized reserve basis. Each company in each state should maintain reserves equal to the present value of all the losses, not only those which have already been incurred, but also those which may be expected in the future on the policies now in force.

The reserves to be kept in workmen's compensation are of three kinds. These are: first, the reserve for outstanding losses; second, the reserve for the catastrophe hazard; and third, the unearned premium income.

The reserve for the unearned premium is comparatively simple to calculate. It is merely the proportionate part of the total premium which remains unexpired. For example, suppose a one year policy has run six months. Then the reserve for the unearned premium is one-half of the total premium which had been collected. Some difficulties are encountered, due to the number of policies, the varying times at which they are issued, and the numerous differentials in the different states, but these are of small moment, and necessitate only some kind of a system of group valuation with regard to the time of issue.

The reserve for the catastrophe hazard offers no difficulty. It is common among insurance companies to reinsure this risk. A single large loss might seriously affect any but the largest companies. For this reason the risk of losses in excess

of \$25,000 is very generally reinsured. There are two organizations in which the stock companies reinsure. These are the London Lloyds and the Workmen's Compensation Reinsurance Bureau, an organization maintained by fifteen stock companies. The mutual companies also reinsure the catastrophe hazard, either in the London Lloyds or the Mutual Corporations' Reinsurance Fund, which consists of nine mutual companies in New York.¹

It is the matter of the reserves for outstanding claims that affords the difficulty. There are three kinds of these reserves:

"1. Reserves to provide for the payment of sums to become due in future under awards already made.

"2. Reserves to provide for the payment of sums to become due under claims already filed for which no award has yet been made.

"3. Reserves to provide for the payment of sums to become due under claims which may be filed because of accidents that have already occurred."²

Theoretically each of these claims should be valued on its merits. Practically such a procedure is almost impossible. It is not feasible to set up a specific reserve for an accident whose nature may not be ascertained for months to come. Some

¹ Compare Ralph H. Blanchard, Insurance of the Catastrophe Hazard, Annals of the American Academy of Political and Social Science, March, 1917, page 225.

² Miles M. Dawson, Workmen's Compensation Claim Reserves, Proceedings of the Casualty, Actuarial, and Statistical Society, November, 1914, page 95.

system of "retrospective" rather than "prospective" reserves becomes necessary. As the method is outlined by Mr. Joseph H. Woodward¹ all claims are to be based on the net premium collected less losses paid, for a full calendar year since the date of the accident, after which time the reserve is to be based on the status of each outstanding claim.

This would mean that the average length of time for which a claim would be valued as the amount of net premium less losses paid (retrospectively) would be eighteen months. Under this method it is estimated that less than five percent of all the claims need be valued prospectively--on the estimated present value of each individual claim.²

The Proposed Reserve Law

That a period of eighteen months is not a sufficiently long time to elapse before claims can be accurately valued individually appears now to be recognized. The Committee on Reserves other than Life of the National Convention of Insurance Commissioners has formulated a bill to be introduced before various state legislatures which provides "that the reserves on compensation policies issued more than three years prior to the date of valuation shall be the present value of future payments, and the reserves on policies of later years of issue shall be 65 percent of earned premium, less losses and loss expenses paid,

¹Workmen's Compensation Reserves, Proceedings of the Casualty, Actuarial, and Statistical Society, November, 1914, page 112.

²Ibid, page 117.

subject, however, to the further requirement that the reserves on policies issued more than two years before the date of valuation shall be at least equal to the present value of future payments."¹

The reserve laws at present in force were enacted to fit the needs of employers' liability insurance. No reserve laws designed specifically for workmen's compensation insurance have thus far been enacted. An attempt has been made to apply the old laws to the reserve requirements necessary for workmen's compensation. It is not to be expected that laws prescribing the amount to be held in reserve for employers' liability insurance should fit the needs of workmen's compensation insurance.

It is planned that the proposed law of the Committee on Reserves other than Life shall supersede the existing laws. As it is of the utmost importance that the laws which the various states pass with regard to reserves shall be based on logical premises and worked out according to present needs it may not be out of place to consider to some extent the character of the act proposed and its probable effects.

Mr. E. H. Downey, in an article in the Annals of the American Academy of political and Social Science,² to which reference has already been made, criticises the proposed act rather severely. While most of his criticisms appear well founded,

¹A text of the proposed law is given in the Economic World for October 21, 1916, page 530. The summary presented is quoted from E.H. Downey. The Public Supervision of Workmen's Compensation Insurance, Annals of the American Academy of Political and Social Science, page 301. March, 1917.

²The Public Supervision of Workmen's Compensation Insurance, The Annals, March, 1917, page 297.

a few seem rather unwarranted.

His main objections to the bill are about as follows:

1. It provides no uniform standard for the valuation of claims.

Such a lack in the bill is doubtless an important defect, since the valuations by individual claim adjusters are very likely to diverge greatly and usually are underestimates.

2. The reserve of 65 percent of the earned premiums less losses paid is not sufficient, and a constant percentage for the various states is not logical.

The average amount of the gross premium provided for the payment of losses is sixty percent. In addition to this there is an item of seven percent for claim adjustments. This totals 67 percent, and as Mr. Downey says "It needs no argument to show that 65 percent of earned premiums is not equal to 67 percent." He raises the further objection that the reserve for the first year is based on the deposit premiums, "which, upon the average, will amount to scarcely 80 percent of the final audited premiums." Moreover, effective account is not taken of inadequate rates or of worse than average loss experience. "It is not sufficient that the aggregate reserves of all carriers shall equal their aggregate liabilities; reserves must be adequate for each carrier."

Mr. Downey's criticism as to the deficiency of two percent in the reserves is doubtless well-founded. More serious, however, is the fact that a constant for all the states is used. If the allowance for expenses is to be divided, as

before explained,¹ into four classes, varying from 35 percent to $42\frac{1}{2}$ percent, the amount left with which to pay claims may vary by $7\frac{1}{2}$ percent. In the case of a $42\frac{1}{2}$ percent ratio the reserve need be only $64\frac{1}{2}$ percent ($57\frac{1}{2}$ percent plus the seven percent allowance for investigation and claim adjustment) while in the case of a 35 percent ratio 72 percent should be required to be held in reserve.

The objection that the first year reserves are based on deposit premiums which are not usually as large as the final audited premiums is not as serious as would first appear. If all the losses of the workmen's compensation business were paid in the year in which the policy is written such a lack might prove disastrous. However, the cost of the accidents under an annuity system of payments is spread over a term of years. A deficiency in the reserve for the first year is of small importance. The amount for succeeding years will be increased by any additional payment made after the audit of the payroll is finished. The principal object to be attained is not that the amount set aside each year shall be mathematically correct, but that the total shall be sufficient to meet all claims as they fall due.

As long as the system of basing premiums on the estimated payroll is used, adjustments will be necessary when the payroll is audited.

Since the insurance companies cannot spend the excess which may result, it may be counted almost as a part of their reserves.

It must be admitted that the matter of inadequate rates and worse than average loss experience is a serious one, but it

¹ Page 63.

would appear that the best way to prevent such an evil is not to provide for it by reserve requirements, but thru a system by which adequate rates are guaranteed, such as has been already outlined, and by requiring a definite minimum amount of capital or surplus as a necessary condition precedent to writing compensation insurance.

3. "The three years' grace allowed the companies in which to reach the new reserve level is grounded on a singular conception of public supervision--the conception, namely, that the main office of insurance departments is to conserve the interests of insurance carriers."

4. "Last, and by no means least, among the many shortcomings of the pending bill is its failure to set aside any explicit fund for the payment of compensation benefits."

These last two criticisms seem evidently well taken, and no further comment will be made on them.

A Suggested Reserve Law

Keeping the foregoing criticisms in mind, one might formulate a system of reserve requirements about as follows. This system would agree in most respects to that set forth by Mr. Downey,¹ but would differ in some particulars:

Reserves for the first three years are to be the earned premiums accumulated at three and one-half percent interest, minus the allowance for expenses with the exception of a

¹Annals of the American Academy of Political and Social Science, March, 1917, page 306.

proportionate amount of the sum set aside for the investigation and adjustment of claims, which amount must be also held with the reserve. The reserves so held must be invested in approved securities.

2. The reserves on business over one year old computed on this retrospective basis are to be checked with an amount estimated to be the necessary reserve computed on the basis of individual claims. If it proves feasible the valuation may be made thru the use of a standard table to be prescribed by the National Convention of Insurance Commissioners. (The description of a proposed standard table of this kind is set forth by Mr. Downey.¹) In case the reserves by the retrospective method used prove to be less than those estimated by individual valuations, the deficiency is to be made up out of surplus and added to the reserves held.

3. After three years each claim must be valued individually, using some such method as outlined by Mr. Dawson in the Proceedings of the Causalty, Actuarial, and Statistical Society for November, 1914,² for the calculation of the present values of annuities, with standard tables of survivorship and remarriage where necessary. The reserve to be held on business over three years old is to be the present value of these claims so calculated, with a further provision for the administration of such

¹Annals of the American Academy of Political and Social Sciences, March, 1917, page 306.

²Workmen's Compensation Claim Reserves, page 90.

claims.

4. A minimum capital or surplus is to be required before a company may write compensation insurance. Mr. Downey recommends that "capital or surplus equal to at least 50 percent of the annual compensation premiums, but in no case less than \$50,000, securely invested and assigned exclusively to compensation liability, should be a condition precedent to the writing of compensation insurance. While the minimum of \$50,000 may not be excessive it would not seem logical that a constant of 50 percent of the compensation premiums should be required in capital. By the theory of fluctuations in sampling it is shown that the degree of fluctuation from an average tends to vary as the square root of the quantity subject to variation. Thus if a capital of \$50,000 is sufficient protection in case business to the extent of \$100,000 is written, it would seem that a company which writes \$400,000 business should be required to have capital or surplus not to the amount of \$200,000, but rather something near \$100,000.

5. Adequate provision should be made for the risk involved in the catastrophe hazard. Mr. Downey recommends that "Sound excess insurance, equal to the maximum catastrophe liability of the carrier involved, should be required of every compensation insurer."

The enforcement of such provisions as these should guarantee that the system would be kept in a solvent condition. The regulations advocated may seem to be too stringent, and to require too much state control of private industry. It must, however, be remembered that workmen's compensation is a form of

industry which vitally concerns the state. Regulation and control are essential that the companies should be protected against themselves, but more important that the compensation act may accomplish its true purpose--the protection of the workman--and not fall into the disrepute into which employers' liability insurance had fallen.

Workmen's compensation has the great advantage over liability insurance that it is founded on a system whose basis is logical, and whose practical working may be accurate and scientific. Its success depends on the degree to which its advantages are utilized, and the manner in which its administration is carried out. If adequacy is maintained and a system of reserves is inaugurated which renders solvency practically certain a great step will have been taken.

It is of little use for actuaries and statisticians to devote their time to making scientific rates if the rates are not maintained and the business is not so regulated that the solvency of the system is unquestioned. If, however, the rate-maker can feel that the rates which he quotes are recognized and are consistently adhered to, he cannot but be imbued with the importance and responsibility of his task. The added incentive to make scientific rates should lead to the creation of new ideas, the formulation of new and improved methods, and the results to be expected in the future may outdo even those which have been accomplished in the past.

BIBLIOGRAPHICAL NOTE

The sources of the material which has entered into the preparation of this paper have been pretty definitely indicated thruout the presentation. Of the material to which reference has been made, none is more than three or four years old, while the greater number of papers mentioned have been published within the last year or two. Some date back only a few weeks. The subject is so recent in its origin, and its development has been so rapid that any article which makes a claim of setting forth methods and standards as they exist today must give as its references other articles of a very recent date. Indeed, most of the papers written more than a year or two ago are almost obsolete. The citations that have been made thruout the thesis set forth the greater number of the most important recent contributions to the subject, and their sources should suggest to the student of rate-making the sources of information in the future.

Rate-making is essentially a study for the future. Its future developments should be so great that new methods will supersede present practises as completely as the methods now used have taken precedence over those employed in the past. For this reason it was not thought necessary nor advisable to give a more detailed bibliography than has been indicated by the references which have been given thruout the presentation.

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